

It is hereby certified that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the U.S. Postal Service as Express Mail, Airbill No. EV 872310675 US, on the date shown below in an envelope addressed to: MS Appeal Brief - Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Dated: December 9, 2008

Signature:

(Juan Quintana)

Docket No.: 29214/40015  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Patent Application of:  
Brian R. Samuels

Application No.: 10/798,462

Confirmation No.: 6413

Filed: March 11, 2004

Art Unit: 1794

For: Film Having a Liquid Absorbed Therein

Examiner: Marc A. Patterson

**APPEAL BRIEF**

MS Appeal Brief - Patents  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

This Appeal Brief is submitted in triplicate to support the Notice of Appeal filed in this application on June 2, 2008. This Appeal Brief was originally filed September 18, 2008, accompanied by the fee for filing an Appeal Brief under 37 C.F.R. §1.17(b) and a two-month extension of time under 37 C.F.R. §1.136(a). Accordingly, this Appeal Brief was timely filed and no further fees are believed due. This Appeal Brief is submitted in response to a Notification of Non-Compliant Appeal Brief dated November 14, 2008.

Any additional required fee may be charged, or any overpayment credited, to Deposit Account No. 13-2855.

## II. TABLE OF CONTENTS

I.	Identification Page.....	1
II.	Table of Contents .....	2
III.	Real Party in Interest.....	3
IV.	Related Appeals and Interferences.....	4
V.	Status of Claims .....	5
A.	History .....	5
B.	Current Status of Claims.....	5
C.	Claims on Appeal .....	5
VI.	Status of Amendments .....	6
VII.	Summary of Claimed Subject Matter.....	7
VIII.	Grounds of Rejection to be Reviewed on Appeal .....	12
IX.	Argument.....	13
A.	Introduction .....	13
B.	Proper Basis for a §102(b) Anticipation Rejection .....	13
C.	Proper Basis for a §103(a) Obviousness Rejection .....	14
D.	Rejection of Claims 42-44 and 46-50.....	17
1.	Disclosure of WO ‘798.....	17
2.	Rejection of Claims 42-44 and 46-50 under 35 U.S.C. §102(b) as Being Anticipated by WO ‘798.....	19
E.	Rejection of Claims 1-3, 6, 7, 9, 12-15, and 17.....	25
1.	Disclosure of the Erk et al. ‘520 Patent.....	25
2.	Disclosure of the Shimizu et al. ‘762 Patent .....	26
3.	Rejection of Claims 1-3, 6, 7, 9, 12-15, and 17 under 35 U.S.C. §103 as Being Obvious Over Erk et al. ‘520 in view of Shimizu et al. ‘762 Patent .....	27
F.	Rejection of Claim 16.....	33
1.	Disclosure of EP ‘957.....	33
2.	Rejection of Claim 16 under 35 U.S.C. §103 as Being Obvious Over Erk et al. ‘520 in View of the Shimizu et al. ‘762 Patent and Further in View of EP ‘957.....	34
G.	Rejection of Claims 45 and 51-54 .....	34
H.	Claim 55 .....	37
I.	Response to Examiner’s Answers to Applicant’s Arguments.....	38
X.	Conclusion.....	43
	Claims Appendix .....	A1
	Evidence Appendix.....	A5
A.	Definition and Examples of Block Copolymers.....	A6
B.	Figures of U.S. Patent Application No. 10/798,462.....	A16
	Related Proceedings Appendix.....	A22

### **III. REAL PARTY IN INTEREST**

The real party in interest in this appeal is Vector USA Inc., Oak Brook, Illinois, the assignee of the entire right, title, and interest to the above-identified patent application. The assignment was recorded in the United States Patent and Trademark Office ("USPTO") at Reel 15466, Frame 0111 on June 7, 2004, which constitutes the entire chain of title from the inventors to Vector USA, Inc.

**IV. RELATED APPEALS AND INTERFERENCES**

There are no related appeals or interferences known to appellant, appellant's legal representative, or the assignee which will directly affect or be directly affected by, or have a bearing on, the Board's decision in the pending appeal.

**V. STATUS OF CLAIMS**

**A. HISTORY**

This application was originally filed with claims 1-41. Claims 42-55 were added to the application during prosecution of the application.

**B. CURRENT STATUS OF CLAIMS**

Claims cancelled: 4, 5, 8-11, 18-42, 44, and 46.

Claims withdrawn from consideration but not cancelled: None.

Claims pending: 1-3, 6, 7, 12-17, 43, 45, and 47-55.

Claims allowed: None.

Claims rejected: 1-3, 6, 7, 12-17, 43, 45, and 47-55.

**C. CLAIMS ON APPEAL**

The claims on appeal are claims 1-3, 6, 7, 12-17, 43, 45, and 47-55.

**VI. STATUS OF AMENDMENTS**

Appellant filed an amendment on February 4, 2008, which was entered. A rejection was issued on March 13, 2008. Accordingly, appellant understands that the current form of the claims is represented by Amendment "D", filed February 4, 2008, and as reproduced in the Claims Appendix below.

## VII. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention is directed to a nylon film consisting only of monomers that provide amide linkages, i.e., a polyamide. Such films are known in the art as hydrophobic films and are incapable of absorbing sufficient amounts of aqueous liquids for effective transfer to a food product. Appellant has found, unexpectedly, that by subjecting a nylon film to a high amount of total energy, this high amount of total applied energy provides more than a mere surface activation, but actually *permanently* changes the morphology of the nylon film. This change allows a previously hydrophobic nylon film to absorb increased amounts of an aqueous liquid, *without* the presence of a hydrophilic comonomer in the nylon film.

The permanent change in nylon film morphology is clearly shown in Figs. 3-6 and Example 4 of the specification. This portion of the specification shows that an aqueous solution is not merely coated on the surface of the film, but is absorbed well into the film. Importantly, about one half of the film structure is modified in permanent way, such that even after an aqueous liquid is extracted from the film, the modified structure *still remains*, i.e., is permanent. See Evidence Appendix B, pages A-16 through A-21, below.

The fact that the nylon film structure had been permanently changed is a surprising result, that could not have been predicted from any known prior art. As known in the art, corona treatment is used to modify the surface character of a film to promote meat adhesion or to improve printability on the film, and it also is well known that this surface modification can be removed by wiping the surface with brushes or a cloth. This is a common practice after printing on a film to prevent the film layers from adhering to one another. It also is known that an excessive surface active treatment can lead to disadvantages, such as excessive meat adhesion. See specification, page 8, line 4 through page 9, line 2. There is no known art teaching that a corona or similar energy treatment permanently alters or modifies the structure of a nylon film to a depth of about 5 microns which permits the nylon film to absorb a greater amount of an aqueous liquid.

The application of a high total level of energy to a nylon film to arrive at the present invention is disclosed in the specification at page 17, lines 16-22, stating:

"In the experiments it was observed that the surface activation was so high, that the dyne level was outside of the usual dyne

measurement techniques. For this reason in future tests the level of surface activation was estimated in terms of watt density.

Watt density is calculated according to the following formula:

$$\text{Watt density} = \frac{\text{power supply (watts)}}{\text{Width of tube(M) x line speed min/M)"}"$$

It is important to note that Watt density (W-min/m<sup>2</sup>) is *not* a measure of surface activation, but is a measure of the total energy that is absorbed by the film.

In order to achieve the high levels of energy required to achieve the benefits of the presently claimed invention, appellant utilized a specially prepared, highly powered corona treatment device, i.e., having a power greatly exceeding that of commercially available devices. In fact, the designers of the corona treatment device were concerned that, at such high power levels, the film would be destroyed, as opposed to improved. However, the very high energy levels applied actually resulted in an increased amount of liquid absorbing into the film. This is proven by the photomicrographs in Figs. 3-6 and in the Tables of the specification, and was highly unexpected.

Each pending claim recites a film consisting of nylon, wherein a surface of the nylon film is activated using a high total amount of energy. The high energy treatment allows the nylon film to absorb more liquid after the surface activation than prior to the surface activation. The features of the present invention are clearly set forth in the independent claims 1 and 52.

Independent claim 1 recites a nylon film *consisting of* (a) one or more aliphatic primary diamine and one or more aliphatic dicarboxylic acid, (b) an omega-aminocarboxylic acid, (c) an omega-aminocarboxylic lactam, or (d) a mixture of two or three of (a), (b), and (c), (specification, page 6, line 26 through page 7, line 4) and having a liquid at least partially absorbed therein (specification, page 1, lines 8 and 9 and page 5, lines 20 and 21, for example). The film therefore is purely a nylon film having *all* monomers that provide a polyamide and *no* comonomers that provide a linkage different from an amide in the polymer chain.

Independent claim 1 also recites that the liquid is applied to a surface of the nylon film, and, prior to application of the liquid to the surface, the surface is surface activated such



that the surface has a dyne level of at least about 50 dynes (claim 1) or at least 70 dynes (claim 55). Specification page 5, lines 20-24 and page 6, lines 1-6. Furthermore, claim 1 recites that the amount of liquid able to be absorbed by the nylon film after said surface activation is higher than the amount able to be absorbed before said activation. Specification, page 17, Table 2 and lines 12-15, page 18, Table 3, page 19, Table 4, and pages 21 and 22, Table 5, for example.

Independent claim 52 recites a nylon film *consisting of* (a) one or more aliphatic primary diamine and one or more aliphatic dicarboxylic acid, (b) an omega-aminocarboxylic acid, (c) an omega-aminocarboxylic lactam, or (d) a mixture of two or three of (a), (b), and (c), (specification, page 6, line 26 through page 7, line 4) and having a liquid at least partially absorbed therein (specification, page 1, lines 8 and 9 and page 5, lines 20 and 21, for example). The film therefore is purely a nylon film having *all* monomers that provide a polyamide and *no* comonomers that provide a linkage different from an amide in the polymer chain.

Independent claim 52 also recites that the aqueous liquid is applied to a surface of the nylon film, and prior to application of the liquid to the surface, the surface is surface activated by the application of energy such that the surface receives a watt density of at least about 75 W-min/m<sup>2</sup> (claim 52) and up to about 500 W-min/m<sup>2</sup> (claim 53). Specification, page 17, Table 2 and page 19, Table 4 (claims 52, 53, and 55). Furthermore, claim 52 recites that the amount of liquid able to be absorbed by the nylon film after said surface activation is higher than the amount able to be absorbed before said activation. Specification, page 17, Table 2 and lines 12-15, page 18, Table 3, page 19, Table 4, and pages 21 and 22, Table 5, for example.

Claim 55 recites that the surface has a dyne level of at least 70 dynes. Claim 53 recites that the surface receives energy of a watt density of up to about 500 W-min/m<sup>2</sup>. Specification, Table 2, page 17; Table 3, page 18; Table 4, page 19 and page 9, lines 9-12, for example.

Claim 2 recites that the film of claim 1 is surface activated by plasma treatment, flame treatment, corona discharge, UV irradiation, electron beam irradiation, or gamma irradiation.

Claim 3 recites that the film of claim 1 is activated by corona discharge. Specification page 7, line 31 through page 8, line 3.

Claim 6 recites that the liquid has been applied to the surface in an amount of between about 0.4 to about 10mg/cm<sup>2</sup>. Specification, page 9, lines 7-9.

Claim 7 recites that the film is in the form of a food packaging film, whereby in use the surface is a food contact surface. Specification, page 13, lines 17-21.

Claim 12 recites that the food packaging film of claim 7 is in the form of a tubular casing. Specification, page 13, lines 10-16 and 22-25.

Claim 13 recites that the liquid applied to the nylon film consists essentially of water. Specification, page 11, line 25 through page 26, line 4.

Claim 14 recites that the liquid applied to the nylon film comprises at least one additive for transfer to a packaged food product. Claim 15 recites that the additive is selected from the group consisting of a coloring agent, a flavoring agent, and a coloring and flavoring agent. Specification, page 9, line 19 through page 11, line 19.

Claim 16 recites that the additive for transfer to a packaged food product comprises a Maillard reagent. Specification, page 9, line 23 through page 10, line 11, and page 11, lines 10-12.

Claim 17 recites that the liquid applied to the nylon film includes an antimicrobial agent, a fungicide, or an antiviral agent. Specification, page 11, lines 20-24.

Claim 43 recites a film having a second polyolefin layer. Claim 47 recites that the film has a third outer nylon layer. Claim 48 recites that the outer layer is nylon 66. Specification, page 6, lines 13-25, page 12, lines 9-12, and page 16, lines 1-4.

Claim 45 recites that the nylon film is nylon 6. Specification, page 16, lines 4-5.

Claims 49 and 54 recite that the liquid is absorbed to a depth of about one-half of a thickness of the nylon surface layer. Claim 50 recites that the liquid is absorbed to a depth of

up to about 5 microns of a thickness of the nylon surface layer. Specification, page 24, Example 4, lines 6-30.

Claim 51, which depends from claim 1, recites that the nylon surface layer is subjected to a surface activation treatment such that the surface has a watt density of at least 50 W-min/m<sup>2</sup>. Specification, page 9, lines 9-12, and page 19, Table 4, lines 23-25, and pages 21 and 22, Table 5.

### **VIII. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

Whether claims 42-44 and 46-50 are anticipated under 35 U.S.C. §102(b) by WO 97/36798 (WO '798).

Whether claims 1-3, 6, 7, 9, 12-15, and 17 would have been obvious under 35 U.S.C. §103 over Erk et al. U.S. Patent No. 4,560,520 ('520) in view of Shimizu et al. U.S. Patent No. 6,352,762 ('762).

Whether claim 16 would have been obvious under 35 U.S.C. §103 over the '520 patent in view of the '762 patent and further in view of EPO 0 986 957 (EP '957).

Whether claims 45 and 51-54 would have been obvious under 35 U.S.C. §103 over WO '798.

Whether claim 55 would have been obvious under 35 U.S.C. §103.

For purposes of the issues on appeal, dependent claims 2, 3, 6, 7, 12-17, 43, 45, 47-50, and 55 are grouped and argued with independent claim 1.

Claims 51, 53, and 54 are grouped with claim 52 to form a second group that is argued separately.

## **IX. ARGUMENT**

### **A. INTRODUCTION**

Appellant submits that the rejections issued in the final Office Action are in error, and that the present application is in condition for allowance. Appellant respectfully requests the Board to review and reverse each of the rejections issued in the final Office Action.

### **B. PROPER BASIS FOR A §102(b) ANTICIPATION REJECTION**

"Anticipation requires a showing that each limitation of a claim is found in a single reference, either expressly or inherently." *Atofina v. Great Lakes Chemical Corp.*, 441 F.3d 991, 999 (Fed. Cir. 2006).

A determination that a claim is anticipated under 35 USC §102 involves two analytical steps. First, the U.S. Patent and Trademark Office (Patent Office) must interpret the claim language, where necessary, to ascertain its meaning and scope. In interpreting the claim language, the Patent Office is permitted to attribute to the claims only their broadest *reasonable* meaning as understood by persons having ordinary skill in the art, considered in view of the entire disclosure of the specification. *See in re Buszard*, 504 F.3d 1364 (Fed. Cir. 2007) (reversing a Patent Office decision that applied an unreasonably broad interpretation to a claim); see also, *In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997). Second, the Patent Office must compare the construed claim to a single prior art reference and set forth factual findings that "each and every limitation is found either expressly or inherently [disclosed] in [that] single prior art reference." *Celeritas Techs. Ltd. v. Rockwell Int'l Corp.*, 150 F.3d 1354, 1350 (Fed. Cir. 1998). Additionally, "[t]he identical invention must be shown in as complete detail as is contained in the patent claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1225, 1236 (Fed. Cir. 1989).

With further respect to a rejection under 35 U.S.C. §102(b), MPEP §2131 states:

"TO ANTICIPATE A CLAIM, THE REFERENCE MUST TEACH EVERY ELEMENT OF THE CLAIM"

'A claim is anticipated only if each and every elements as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.' *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)...The identical invention must be

shown in as complete detail as is contained in the...claim.' *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. In *re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990)."

With respect to the term "consisting of", it is well settled that a transitional phrase defines the scope of a claim with respect to what unrecited additional components or steps, if any, are excluded from the scope of the claim. The transitional phrase "consisting of" excludes any element, step, or ingredient not specified in the claim. *In re Gray*, 53 F.2d 520, 11 USPQ 255 (CCPA 1931/91 *Ex parte Davis*, 80 USPQ 448, 450 (Bd. App. 1948) ("consisting of" defined as "closing the claim to the inclusion of materials other than those recited except for impurities ordinarily associated therewith.") See MPEP §2111.03.

### C. PROPER BASIS FOR A §103(a) OBVIOUSNESS REJECTION

A determination that a claimed invention would have been obvious under §103(a) is a legal conclusion involving four factual inquiries: (1) the scope and content of the prior art; (2) the differences between the claimed invention and the prior art; (2) the differences between the claimed invention and the prior art; (3) the level of ordinary skill in the pertinent art; and (4) secondary considerations, if any, of non-obviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). Secondary considerations of non-obviousness include factors such as commercial success, long-felt but unresolved needs, the failure of others, and/or *unexpected results achieved by the claimed invention*. *Id.* Obviousness is determined from the vantage point of a hypothetical person having ordinary skill in the art which the claimed subject matter pertains, who is presumed to have all prior art references in the field of the invention available to him/her. *In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998). Furthermore, obviousness must be determined as of the time the invention was made and in view of the state of the art that existed at that time. *Uniroyal Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 1050-51 (Fed. Cir. 1988).

The Patent Office must clearly articulate facts and reasons why the claimed invention "as a whole" would have been obvious to a hypothetical person having ordinary skill in the art at least as of the claimed invention's effective filing date. *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007) (citing with approval *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir.

2006) ("[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness."); see also MPEP §2143 ("The key to supporting any rejection under 35 U.S.C. §103 is the clear articulation of reason(s) why the claimed invention would have been obvious.").

To reach a proper determination under 35 U.S.C. §103(a), the examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. In view of all factual information, the examiner must then make a determination whether the claimed invention "as a whole" would have been obvious at that time to that person. Knowledge of applicants' disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the "differences," conduct the search, and evaluate the "subject matter as a whole" of the invention. The tendency to resort to "hindsight" based upon applicant's disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the *facts* gleaned from the prior art. MPEP §2142.

As recently articulated by the Court of Appeals for the Federal Circuit in *Ortho-McNeil Pharmaceutical Inc. v. Mylan Laboratories Inc.*, 86 USPQ 2d, 1196, 1201-2 (Fed. Cir. 2008):

"As this court has explained, however, a flexible TSM test remains the primary guarantee against a non-statutory hindsight analysis such as occurred in this case. *In re Translogic Tech., Inc.* 504 F.3d 1249, 1257 [84 USPQ 2d 1929] (Fed. Cir. 2007) ("[A]s the Supreme Court suggests, a flexible approach to the TSM test prevents hindsight and focuses on evidence before the time of invention.)."

Furthermore, to establish a *prima facie* case of obviousness, the examiner must satisfy three requirements. First, as the U.S. Supreme Court very recently held in *KSR International Co. v. Teleflex Inc. et al.*, 127 S.Ct. 1727 (2007), "a court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions. ...it [may] be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to

determine whether there was *an apparent reason* to combine the known elements in the fashion claimed by the patent at issue. ...it can be important to *identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements* in the way the claimed new invention does... because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known." (emphasis added, *KSR, supra*). Second, the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *Amgen Inc. v. Chugai Pharm. Co.*, 18 USPQ2d 1016, 1023 (Fed. Cir. 1991). Lastly, the prior art references must teach or suggest all the limitations of the claims. *In re Wilson*, 165 USPQ 494, 496 (C.C.P.A. 1970).

Once the Patent Office properly sets forth a prima facie case of obviousness, the burden shifts to the applicants to come forward with evidence and/or argument supporting patentability. *See In re Glaug*, 283 F.3d 1335, 1338 (Fed. Cir. 2002). Rebuttal evidence is merely a showing of facts supporting the opposite conclusion." *In re Piasecki*, 745 F.2d 1468,1472 (Fed. Cir. 1984). Evidence rebutting a prima facie case of obviousness can include: (a) "evidence of unexpected results," *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348 1369 (Fed. Cir. 2007); (b) "evidence that the prior art teaches away from the claimed invention in any material respect," *In re Peterson*, 315 F.3d 1325, 1331 (Fed. Cir. 2003); and, (c) evidence of secondary considerations, such as commercial success or long-felt yet unmet needs, *WMS Gaming, Inc. v. International Game Tech.*, 184 F.3d 1339, 1359 (Fed. Cir. 1999). The Patent Office must always consider such evidence supporting patentability. *See, e.g., In re Sullivan*, 498 F.3d 1345, 1352-53 (Fed. Cir. 2007) (reversing a Patent Office decision of obviousness because the Patent Office failed to consider the applicants' evidence rebutting a prima facie case of obviousness because the Patent Office failed to consider the applicants' evidence rebutting a prima facie case of obviousness). If the Patent Office determines that such evidence is not compelling or is insufficient, then the Patent Office should specifically set forth the facts and reasoning supporting that determination. MPEP §2145 (8<sup>th</sup> Ed., Rev. 6, Sept. 2007).



#### **D. REJECTION OF CLAIMS 42-44 AND 46-50**

Claims 42-44 and 46-50, directed to a nylon film, stand rejected under 35 U.S.C. §1 02(b) as being anticipated by WO 97/36798.

##### **1. Disclosure of WO '798**

WO '798 discloses a film formed from a *block copolymer* having substantially water-insoluble segments and substantially hygroscopic segments (see WO '798 abstract, page 3, lines 27-30, and page 4, lines 11-13 and 17-18, for example). The hygroscopic segment is formed from a coreactant capable of homopolymerizing to provide a material that is substantially hygroscopic, and the water-insoluble segment is formed from a coreactant capable of homopolymerizing to provide a material that is substantially water insoluble. See WO '798, page 8, lines 3-15. The hygroscopic segments retain an aqueous modifier, or additive, that is transferred to a food product (WO '798, page 8, lines 16-26). The water-insoluble segment does *not* dissolve or absorb the aqueous modifier, rather its purpose is to provide structural integrity to the film such that the film remains intact upon separation from a food product (WO '798, page 8, line 27 through page 9, line 2). In other words, WO '798 discloses a polymer having structural segments (water insoluble) and absorbing segments (hygroscopic). The water insoluble segments are derived from an amide, for example, or other hydrophobic monomers (WO '798, page 9, lines 24-29). The hygroscopic segments are *different* from an amide, like nylon, as set forth in WO '798 at page 10, lines 10-26. An example of a block copolymer disclosed in WO '798 is PEBAX™ MX 1074 and 6031, each containing *blocks* of nylon 12 and poly(ethylene glycol). WO '798, page 11, lines 7-12).

WO '798 specifically discusses the purpose of the hygroscopic blocks, i.e. (1) in the following paragraph, and the hydrophobic blocks, i.e., (2) in the following paragraph at page 9, lines 3-7:

"Thus, a copolymer including both water-insoluble and hygroscopic segments advantageously (1) allows for sorption and subsequent transfer (to a food product during cook-in) of a modifier, and (2) remains intact (or at least substantially intact) so that the food-contact layer can be separated from the food product at any desired time after cooking"; and

at page 8, lines 11-14:

“The two types of segments function both interdependently, in *that they are inseparable parts of the same polymer*, and independently, that they provide the polymer of the food-contact layer with water insolubility and hygroscopicity” (Emphasis added).

WO '798 refers to using corona treatment to increase the surface energy of the food contact layer solely to increase adhesion between the film and the food product, thereby reducing undesirable purge or cookout. In particular, WO '798 states at page 13, lines 1-21:

"To assist in reducing or eliminating cook-out, a food-contact layer having a surface energy of greater than 34 dynes/cm, preferably greater than 46 dynes/cm, and most preferably greater than 50 dynes/cm is preferred. At such surface energies, the food-contact layer is believed to provide sufficient adhesion with the food product to prevent or substantially minimize cook-out.

If the film adheres so strongly to the cooked food product such that it cannot be peeled therefrom without tearing away portions of the same, the copolymer of the food-contact layer can be blended with one or more polymers that lower its adhesion. In this regard, less polar polymers such as polyolefins having a surface energy of about 36 dynes/cm or less can provide beneficial results. On the other hand, if adhesion between the film article and food product is too low, the surface energy of the food-contact layer can be increased. This can be accomplished by, for example, subjecting the surface of the food-contact layer to sufficient energetic radiation (i.e., of sufficiently high intensity or for a sufficiently long period of time) to achieve a desired increase in surface energy. Examples of radiative techniques include plasma and corona treatments. Alternatively, the surface energy of the food-contact layer can be increased by including one or more polar additives such as polyesters, polyamides, polylactic acid, and polar polyolefins such as ethylene/unsaturated acid copolymers, modified polyolefins, and blends thereof."

It must be noted that WO '798 *cautions against* the surface activity of a film being too high because this will lead to tearing of the product upon film removal (page 13, lines 7-8).

The first paragraph of the above excerpt refers to a surface modification that does not contemplate a nylon film as presently claimed, i.e., that can *absorb* a liquid. The second paragraph teaches blending in a polyolefin to reduce surface energy, or increasing surface energy of the *block copolymer* by plasma or corona treatment. Importantly, WO '798 states that "[A]lternatively, the surface energy...can be increased by including...polyamides..." Accordingly, WO '798 does *not* teach surface treating a polyamide, but rather adding a polyamide to the block copolymer to increase surface energy, if necessary. See specification,

page 8, lines 26-30, stating that polyamide casing materials having a surface energy of up to about 45 dynes is sufficient for meat adherent properties, and if corona treatment is used, the resulting film would adhere excessively to a meat surface.

**2. Rejection of Claims 42-44 and 46-50 under 35 U.S.C. §102(b) as Being Anticipated by WO '798**

First, it must be noted that this rejection of claims 42, 44, and 46 is moot because these claims were cancelled in Amendment "D," filed February 4, 2008.

Second, claims 43 and 47-50 each depend, directly or indirectly, from claim 1. Appellant questions how claims 43 and 47-50 can be anticipated by WO '798 when independent claim 1 does not stand rejected under 35 U.S.C. §102 or §103 over WO '798.

Initially, independent claim 1 was rejected under 35 U.S.C. §102(b) as being anticipated by WO '798. Appellant provided sufficient reasoning to demonstrate that claim 1 is patentable over WO '798, and the rejection of claim 1 over WO '798 was withdrawn. Appellant repeats these arguments for the benefit of the Board, and submits that because claim 1 is patentable over WO '798, pending dependent claims 43 and 47-50 also are patentable over WO '798.

Importantly, the present claims recite a nylon film having *only* (i.e., consisting of) amide units, i.e., a polyamide *only*, and exclude other monomers and blocks of monomers from the nylon polymer. The monomers recited in claim 1, i.e., (a), (b), (c), and mixtures thereof, *all* provide a nylon. The claimed nylon film is *not* a block polymer and, nevertheless, is free of hygroscopic monomers and segments. In addition, the examiner admits that the film of WO '798 is an ether/amide block copolymer (Office Action of March 13, 2008, page 2).

A presently claimed nylon film differs substantially from a block copolymer film of WO '798, thereby precluding a rejection under 35 U.S.C. §102(b) and under 35 U.S.C. §103. The very term "block copolymer" means that the polymer contains at least two monomers and that the monomers are arranged in a specific manner, i.e., distinct polymer segments of monomer A and distinct polymer segments of monomer B. A schematic example of a block copolymer includes: -A-A-A-B-B-B-A-A-A-B-B-B-. To further illustrate a block

copolymer, appellant provided a definition of the term and examples in a prior response and includes this information, in the Evidence Appendix, pages A6-A15. WO '798 explicitly teaches a *block* copolymer having a water-insoluble segments prepared from a first monomer (see WO '798, at page 9, lines 19-29) and hygroscopic segments prepared from a *different* second monomer (see WO '798, at page 9, line 30, page 10, line 26).

Appellant also specifically wishes to direct attention to Example 4 at page 24 of the specification and the accompanying SEM micrographs in Figures 3-6, and particularly Figure 4. Example 4 and the SEM micrographs explicitly demonstrate that a coating composition of Example 1 (i.e., C7) was not merely coated on the inner layer, but had been *absorbed* into the inner layer. Most importantly, the innermost 50% of the inner layer structure of the nylon had been modified *permanently*. This permanent modification converted the hydrophobic nylon film (and identified as such in WO '798) into a film having an improved capability of absorbing aqueous liquids, which is both new and unexpected in the art.

In particular, after the coating composition was extracted from the inner layer, the modified nylon structure still remained. As stated in the specification at page 24, lines 10-16:

"Initial results showed that the principal difference between untreated and absorbed film was that a 10 micron thick porous inner layer with irregular surface morphology was changed into a 5 micron thick porous layer and a 5 micron thick nonporous innermost layer with irregular surface morphology. This indicated that the composition had absorbed into the inner film layer and impregnated the inner layer to a depth of about ½ the original thickness."

Claims 49, 50, and 54 recite this feature.

The present specification at page 8, lines 26-30 states:

"Polyamide casing materials which have a surface energy in the order of up to about 45 dynes generally have sufficient meat adherent properties and corona treatment is not required. It is believed that if a polyamide was corona treated, the resulting film would adhere excessively to a meat surface, causing the above-mentioned problems."

Although WO '798 may disclose that the block copolymer disclosed in the reference can have a surface energy of greater than 50 dynes, persons skilled in the art understand that the

surface energy of a *polyamide* should *not exceed* 45 dynes. It is submitted, therefore, that WO '798 fails to teach or suggest a high total energy surface treatment of a hydrophobic polyamide, or to provide a nylon film consisting of amide groups *only*, as claimed, which is permanently altered in structure and capable of absorbing liquids.

The examiner states that WO '798 discloses a film having a liquid absorbed therein, wherein the surface of the film can have a surface energy of at least 50 dynes. The examiner also states that the feature of corona treatment and liquid application are to be given little patentable weight because the limitations are directed to a process limitation. As discussed below, appellant traverses this contention because the claimed features are *not* directed to a process limitation, but to features of the nylon film.

The present claims recite a *nylon* film, which is substantially different from the block copolymer of WO '798. The block copolymer of WO '798 *requires* a hydrophobic block (e.g., nylon) and a hygroscopic block (e.g., WO '798, page 10, lines 10-26). The present claims recite a nylon *consisting* of the amide-forming monomers recited in the claims. The claimed nylon therefore *by definition* contains only repeating amide units and is substantially different from a block copolymer disclosed *and* required by WO '798.

In addition, it appears that the examiner either does not understand the nylon film being claimed or has incorrectly represented the claimed nylon film. In the Office Action of March 13, 2008, at page 2, the examiner states

“the liquid is absorbed into a layer comprising polyamide which is a ether/amide block copolymer (page 10, lines 27-30 and page 11, lines 7-12); the amide polymer is nylon 12 (page 11, lines 7-12), therefore an aliphatic primary diamine, therefore formed of nylon consisting of aliphatic primary diamine and aliphatic dicarboxylic acid”.

The examiner correctly notes that the copolymer is an ether/amide block copolymer, and that the *amide segments* are nylon 12. However, the examiner has failed to note that WO '798, at page 11, lines 7-12 states that the copolymer contains “*blocks* of nylon 12 *and* poly(ethylene glycol)”. The presently claimed nylon film contains only nylon, i.e., consisting of, and is free of poly(ethylene glycol) and other hygroscopic segments disclosed in WO '798.

On this basis alone WO '798 cannot anticipate the present claims. However, the present claims also recite that the amount of liquid absorbed by a nylon film having a surface dyne level of at least about 50 dynes (or at least 70 dynes in claim 55) absorbs more liquid than the same nylon film surface that has not been surface activated to such a high degree. Contrary to the examiner's contentions, this *functional* language in the claims has patentable weight and is not directed to a process limitation. A process limitation is given little patentable weight only when a product is the same as in the prior art. In the present case, it is the surface treatment, and degree of surface treatment, that provides a patentably distinct film, structurally and chemically, from a film disclosed in WO '798. It is the surface activation set forth in the claims that provides the differences between the presently claimed films and prior films.

The present claims further distinguishes the present claims from WO '798 and is supported by Table 2, page 17 of the specification showing a 15% and 67.5% increase in absorbed liquid after application of high amount of energy to the nylon film. Also see Tables 3-5 of the specification for additional supporting data.

It is well known the functional language is permissible in claims. See M.P.E.P. §2173.05(g). In particular, functional language is permissible, as long as definite boundaries are set, and often is used when a physical or chemical change or property cannot be adequately described, or is not known, but the effects of the physical or chemical change or property is known and can be claimed. In such a case, there is no other way for appellant to claim his invention.

The present claims recite a surface-activated nylon film, wherein a surface of the nylon film has a dyne level of at least about 50 dynes (at least 70 dynes in claim 55). This is a measurable parameter. Furthermore, the surface activated nylon film has an ability to absorb more liquid than the nylon prior to surface activation. As previously discussed, and as set forth in claims 49, 50, and 54, the activation not only affects the surface of the film, but actively changes the morphology of the film, as shown in Example 4 and Figs. 3-6. This is the feature of the claimed film that permits a hydrophobic polymer to absorb relatively high amounts of an aqueous liquid. These features recited in the claims *are not* process

limitations. The features define the nylon film and the properties of the nylon film, in a manner that fully complies with 35 U.S.C. §112.

WO '798 not only fails to teach or suggest a nylon film as presently claimed, but also fails to teach or suggest *any* significant modification of physical properties of the *water-insoluble* segment of the block copolymer to enable this segment to absorb a liquid because such modification *could decrease* the structural integrity of the water-insoluble segment and potentially lead to failure of the film. In fact, WO '798 discourages modification of the physical properties of the water-insoluble segment, which is present in WO '798 to provide structural integrity. The present claims recite a surface energy of *at least* 50 dynes, which WO '798 discourages. WO '798 fails to teach or suggest the application of sufficient energy to provide a watt density of at least 50 W-min/m<sup>2</sup>.

As stated in the present specification at page 17, lines 24 through page 18, line 5:

"It may also be appreciated by a person of skill in the art that the above dyne levels are well in excess of that achieved by corona treatment as used to facilitate meat adhesion. It is generally accepted that level of between 40 to 50 dynes provide acceptable meat adhesion. It is also generally accepted in the field that if films are treated to a dyne level above about 50 dyne that the film unduly adheres to the meat surface. In the present instance it was surprisingly observed that despite these high levels of surface activation and contrary to expectations the meat film released cleanly from the meat surface without meat scarring."

WO '798 fails to teach or suggest, and fails to consider or address, that surface activation can increase the ability of a *hydrophobic nylon* to absorb a liquid. In fact, the disclosure of WO '798 leads to a contrary conclusion. WO '798 teaches that (1) the presence of a water-soluble segment is *essential* for the film to absorb a liquid and (2) the water-insoluble segment does not absorb liquid but provides structural support. WO '798 merely suggests the possible use of a corona treatment in accordance with *conventional* corona treatments used in the industry to increase surface adhesion of polyolefin films. Such conventional use is acknowledged in the present specification. Appellant submits that a person of skill in the art would therefore understand the reference to corona treatment in WO '798 to refer to the instance when the water-insoluble segment is an olefin. Still further, it is

noted that exemplified films in WO '798 are *not* corona treated, or otherwise surface activated.

Appellant, therefore, submits that a nylon consisting only of amide linkages, which has undergone *sufficient* surface treatment, e.g., to *at least* about 50 dynes or *at least* about 50 W-min/m<sup>2</sup>, and has an increased ability to absorb a liquid, must be physically and/or chemically different from a nylon that is not surface activated, and is different from the segmented-film disclosed in WO '798. It is not incumbent upon the appellant to define, or even theorize, as to what the difference is, but can rely upon claiming the improved properties demonstrated by the surface activated nylon film.

To summarize the differences between the present claims and WO '798, independent claim 1, from which claims 43 and 47-50 depend, recites that the film is a nylon consisting only of amide linkages, which clearly excludes the block amide copolymers disclosed in WO '798, and that surface activation using a sufficiently high amount of energy (which those in the art considered detrimental) actually increases the amount of liquid that can be absorbed by the permanently altered film. Because WO '798 fails to teach or suggest a *nylon* polymer free of other classes of comonomers, the reference cannot anticipate the present claims. These features are neither taught nor suggested by WO '798, which precludes a novelty rejection under 35 U.S.C. §102(b). Because dependent claims 43 and 46-50 each incorporate the features of independent claim 1, these claims also are novel over WO '798. It also is submitted that these are nonobvious differences over WO '798, and that claims 43 and 47-50 are patentable over WO '798 under 35 U.S.C. §103.

With respect to the examiner's reasoning supporting a rejection of individual claims, appellant provides the following:

Claim 43 does not recite polyvinylpyrrolidone or crosslinking. Claim 43 recites a second polyolefin layer in addition to and independent of the nylon film of claim 1.

Claim 44 and 46 were previously cancelled.

With respect to claim 49, WO '798 discloses that "[T]he hygroscopic, i.e., water sorbing or swellable, segments of copolymer sorb and retain at least some of a modifier, particularly aqueous modifiers;..." (page 8, lines 16-18). The reference clearly teaches that



the hygroscopic segments of the block copolymer sorb the liquid. The reference does not state that the hydrophobic segments, e.g., a polyamide, absorb a liquid. The presently claimed film consists only of nylon and no hydrophilic monomers or segments are present. Contrary to the assertion of the examiner, appellant is unable to find where WO '798 teaches "absorption through the entire thickness of the nylon". The reference teaches sorption by the hydrophilic segments of the block copolymer of WO '798.

With respect to claim 50, the reference may teach a thickness of 0.25 to 250  $\mu\text{m}$ . The reference does *not* remotely relate to how deeply an aqueous liquid absorbs into the film. However, claim 50 recites that a liquid is absorbed up to 5 microns of a thickness of the nylon film. The actual thickness of the nylon film is not particularly relevant, it is the depth to which a liquid is absorbed into the nylon film that is important. In addition, even if an aqueous liquid absorbs throughout film, the absorbing segments of the WO '798 polymer are known to absorb large amounts of liquid and are known as being different from the claimed nylon. Nylon is not known to sufficiently absorb liquids for transfer liquid components to a food product, and particularly not a depth of 5 microns.

For all the reasons set forth above, appellant submits that claims 43 and 47-50 are neither anticipated by nor obvious over WO '798, and that the rejection should be reversed. The rejection of claims 42, 44, and 46 is moot in view of the prior cancellation of these claims from the application.

#### **E. REJECTION OF CLAIMS 1-3, 6, 7, 9, 12-15, AND 17**

Claims 1-3, 6, 7, 9, 12-15, and 17, directed to a nylon film, stand rejected under 35 U.S.C. §103 as being obvious over Erk et al. '520 in view of Shimizu et al. '762.

##### **1. Disclosure of the Erk et al. '520 Patent**

The '520 patent is directed to a film for packing foodstuffs. The film is a polyamide that can absorb at least 5% water ('520 patent, Abstract). The '520 patent fails to disclose a film having a dyne level of at least 50 dynes, as admitted by the examiner. The '520 patent also fails to disclose *any* other claimed features, as also admitted by the examiner.

The '520 patent merely discloses a well known property of polyamides, i.e., an ability to absorb small amounts of water. The '520 patent states that to meet the objective of a

wrinkle free, strong casing for a sausage, a polyamide that *can* absorb at least 5% water must be selected. This amount absorbed is defined as storing the polyamide in water at room temperature until the polyamide is saturated. The length of time to reach saturation is not specified, but is known in the art to require minutes or hours.

The fact that the polyamide is able to absorb water is merely a criteria used to select a film as defined by the '520 patent. The film however is dry in use and does not contain a liquid. Note that the examples of the '520 patent utilize *commercial* nylons that are *not* saturated with water, but used as purchased. The reference to water absorption by a nylon in the '520 patent is merely a test for selecting a nylon that can be used in accordance with the '520 patent. The '520 patent fails to teach that a selected nylon can transfer components of a liquid to the sausage, but merely that is wrinkle free and resists tearing.

It must be noted that all polyamides absorb some moisture, up to a saturation level, when exposed to a high humidity. This saturation level is dependent on the type of polyamide and ranges from 3% for a PA 6, 9 to 11% for PA 6, as disclosed in by the '520 patent (Table, columns 9 and 10). This amount however is insufficient for transferring additives in a liquid to a foodstuff. The polyamides used prior to the present invention simply did not absorb a sufficiently quantity of liquid to effectively transfer additives in the absorbed liquid to an encased food product.

The '520 patent therefore teaches no more than a fact well known in the art. The reference is silent with respect to any surface treatments or with respect to a polyamide having a capability of increasing the amount of liquid that can be absorbed.

## **2. Disclosure of the Shimizu et al. '762 Patent**

The '762 patent discloses a polyamide film coated with a water-based coating mixture. The film is printable due to its *adhesiveness* ('762 patent, abstract, and column 2, lines 55-58). The examiner particularly relies upon column 3, lines 23-31 to support the rejection, i.e., that the film is printable. However, the examiner has not considered *all* of the disclosure at column 3, lines 23-31, which recites:

"A coating of polyurethane obtained from polycarbonate polyol has a high wetting index, so treating the surface by corona discharge after forming the film is *unnecessary*." (lines 28-31, emphasis added)

Accordingly, the '762 patent teaches application of a polyurethane coating to improve adhesiveness for printing ink, and teaches away from an energy surface treatment, like corona discharge. The '762 patent is silent with respect to permanently changing a polyamide surface morphology by application of high amounts of energy such that the polyamide can absorb more liquid after surface treatment than prior to surface treatment.

In addition, the '762 patent is directed to coating *non*-food contact *external* surface of a film for a food product, where printing occurs. The reference is not related to the internal, food contact surface of a nylon film, or actually incorporating a liquid into a polyamide film for contact with a food surface and transfer of additives in the liquid to the food product.

The '762 patent also states at column 2, line 66 through column 3, line 3:

“To improve adhesiveness, especially under moistened conditions, it is effective to maintain a contact angle between 45 and 60° via, for example, corona discharge; for the strength of the corona discharge, 30 W-min/m<sup>2</sup> or less is appropriate.”

The '762 patent therefore teaches no more than what is commonly used in the art, i.e., the application of a low amount of energy of 30 W-min/m<sup>2</sup> or less to improve adhesion. See specification page 8, lines 4-15.

**3. Rejection of Claims 1-3, 6, 7, 9, 12-15, and 17 under 35 U.S.C. §103 as Being Obvious Over Erk et al. '520 in view of Shimizu et al. '762 Patent**

As stated above, the primary '520 patent discloses a tubular film used for packing foodstuffs. The tubular film is a polyamide that can absorb at least 5% water. Examples of polyamides having a minimum water absorption capability of 5% at room temperature in the water-saturated state are polycaprolactam (PA 6) and polyhexamethylenedipamide (PA 66) ('520 patent, column 4, lines 62-66).

The '762 patent is silent with respect to permanently changing a polyamide surface morphology such that the polyamide can absorb more liquid after a surface treatment than prior to the surface treatment. In addition, the '762 patent is directed to the *external* surface of a film for a food product, where printing occurs, as opposed to the inner, food contact surface. The reference is not remotely related to actually incorporating a liquid into a

polyamide film for contact with a food surface and transfer of additives in the liquid to the food.

It is submitted that this combination of references fails to teach or suggest the claimed invention as a whole. In particular, the examiner has failed to articulate with facts and reasoning how a combination of the '520 and '762 patents render obvious claims that recite elements that are not even disclosed or suggested, or even addressed, in either reference alone or in combination.

The tubular films of the '520 patent are produced by extrusion of a primary tube of polyamide and subsequent simultaneous multiaxial stretching, and the primary tube of polyamide is completely fixed thermally after multiaxial stretching during controlled multiaxial contraction ('520 patent, column 5, lines 6-12). Example 1 of the '520 patent (column 6, line 44 through column 7, line 19) illustrates a polyamide of the reference. The '520 patent in Example 1 and the specification as a whole *absolutely* fail to teach or suggest *any* surface treatment, let alone a surface treatment that increases the ability of a polyamide to absorb liquids. Such a surface treatment is a necessity in the presently claimed invention because it is the surface treatment that increases the liquid absorption capabilities of the nylon film.

The Board is particularly directed to the Table at columns 9 and 10 of the '520 patent, and particularly Example 1 and Comparative Example 1. Note that the water absorption capacity *remained* at 11% for Comparative Example 1 vs. Example 1 using the *same* polyamide. It is the processing steps of the '520 patent, e.g., the shrinkage step, that provide the improved results, not surface treatments that permanently change surface morphology to achieve absorption of a greater amount of liquid, as presently claimed.

Overall, the '520 patent discloses a process to produce a polyamide casing film that can be used to cook a sausage product. The product must be sufficiently strong and elastic to withstand the cooking pressure and not wrinkle after the sausage is cooled. The type of polyamide is selected based on its ability absorb water to a fully saturated state. The amount of water that can be absorbed is strictly a function of the type of polyamide. The '520 patent disclosure is *silent* with respect to any method of increasing the *amount* of liquid that can be absorbed by a polyamide. Further, the '520 patent does not teach or suggest that the final film

contains a liquid, only that a polyamide should be selected because it can absorb at least 5% of a liquid. The '520 patent fails to teach or suggest a polyamide having an *increased* ability to absorb a liquid.

The '762 patent does not overcome the deficiencies of the '520 patent. As stated above the '762 patent is directed to a film possessing excellent adhesiveness with print ink, laminate, and other coating mixtures (column 1, lines 4-8). The '762 patent goes on to state:

"Polyamide film offers good transparency, physical strength, chemical stability, machine workability, and gas protection ability, and is mainly used for packaging. However, it is normally used with surface treatment. Such treatment includes compounded processes such as printing, metal vapor deposition, lamination with other types of film, or coating. *To improve adhesiveness*, the film surface is conventionally treated by means of corona discharge, low-temperature plasma processes, flaming, or chrome nitrating.

*Despite the use of such adhesiveness-improving processes, polyamide film suffers from insufficient adhesiveness for applications involving print ink, metal vapor deposition, lamination with other films, or use of other coating mixtures, especially under moistened conditions."* ('762 patent, column 1, lines 12-26, emphasis added)

Note that the '762 patent is directed to improving *adhesiveness*, not to improving the ability of a nylon to absorb a liquid. A low energy surface treatment improves adhesiveness, as is well known and discussed in the present specification, page 8, lines 4-15.

The '762 patent then teaches that this disadvantage is overcome by coating the polyamide film with a coating mixture containing constituents A, B, C, as defined in the '762 patent. The '762 patent goes on to state that adhesiveness can be improved by a *mild* corona discharge treatment of which is well known in the art and discussed in the present specification. The '762 patent also states that, after coating with the polyurethane composition of the '762 patent, "treating the surface by corona discharge after forming the film is *unnecessary*" ('762 patent, column 3, lines 28-31, emphasis added). The present specification *and* the cited WO '798 further teach that, according to standards in the art, the corona treatment cannot be too intense because adhesiveness to the food product is too great. The present invention is directly in contrast to standards in the art.

It is clear that the '762 patent is directed to a polyamide film that provides adhesion to print ink, laminates, and coating mixtures in the presence of moisture. This energy level is well below the minimum dyne level recited in the present claims. The '762 patent further illustrates that higher corona treatments will *degrade* the adhesion desired by the '762 patent. This is shown in Comparative Example 1 of the '762 patent, which was corona treated to 54 dyne/cm (Table 1). The adhesive strength of the film was *poor* ('762 patent, column 6, lines 21-24). The laminate intensity (ordinary state) of Comparative Example 1 also was the lowest of all the examples (Table 2). Accordingly, persons skilled in the art would not have been motivated, or have any apparent reason, to simply increase the surface energy of a polyamide to achieve improved film properties, but would be discouraged to do so.

A combination of the '520 and '762 patents fail to render the present claims obvious. The present claims require (a) a nylon film containing only amide linkages *and* (b) having a liquid absorbed therein, *and* (c) the nylon film has a surface activation prior to application of the liquid to a dyne level of at least 50 dynes (at least 70 dynes in claim 55) *and* (d) the film is capable of absorbing a higher amount of liquid after surface activation than before surface activation. The surface activation is performed on the *internal* food contact surface for transfer of components in the liquid from the film to the encased food.

The combined references do not remotely teach or suggest this combination of features or provide an incentive or apparent reason for a person skilled in the art to modify the references in a manner that arrives at the presently claimed invention. In particular, *neither* reference is directed to increasing the ability of a nylon film to absorb liquids. The '520 patent fails to teach any surface modification and '762 patent merely discloses modification of an *external*, non-food contact surface with a polyurethane and possibly a low amount of energy.

The examiner's contention that the majority of the claimed features are given little patentable weight has been addressed above with respect to the rejection based on WO '798. See Section IX.D.2. Applicants have clearly shown that these features have patentable weight, conform with 35 U.S.C. §112, and properly and positively define the invention.

The references, alone and in combination, fail to teach or suggest an increase to the amount of liquid that the polyamide film can absorb, e.g., see the Table of the '520 patent

(discussed above), and the '762 patent is unconcerned with liquid absorption, but is directed to adhesion. Further, the '762 patent relies upon coating an external, non-food contact surface to achieve improved adhesion for printing.

With respect to surface activation, the '520 patent is totally silent and the '762 patent teaches that surface activation is minimal at most, and actually not necessary, because a coating disclosed in the '762 patent provides the improved results. Persons skilled in the art therefore have no incentive to surface activate a polyamide, especially at the claimed high energy level, with any reasonable expectation of achieving unexpected results, especially if that result is improved liquid absorption that is neither taught nor suggested in *either* cited reference. To the contrary, persons skilled in the art would expect the surface to be adversely affected by the high energy treatment that is claimed. For example the '762 patent clearly shows that a high dyne level should be avoided, as discussed above.

With respect to the examiner's comments relating to utilizing the dyne level of the '762 patent to achieve a desired printability, the ability to print on the film is not addressed in the present application and is not claimed. To the contrary, the present specification and cited WO '798 teach against excessive adhesiveness because the film will not separate cleanly from an encased foodstuff. See specification, page 8, lines 16-30, for example. Also, the '762 patent specifically states that a high dyne level is *detrimental* ('762 patent, Comparative Example 1, column 6, lines 7-24).

The examiner's comments with respect to claim 6 are inapposite. Prior nylon films did not absorb this claimed amount of a liquid, so optimization is not involved. The claimed amounts of liquids can be absorbed because morphology of the nylon film has been changed by the high energy treatment. This is a new and unexpected feature in the art.

Further, because neither reference teaches nor suggests liquid absorption, the references cannot provide an incentive or an apparent reason to a person skilled in the art to provide a polyamide that exhibits improved liquid absorption. Appellant clearly has demonstrated, and claimed, polyamides having an increased ability to absorb liquids in the specification at Table 3, showing the improved polyamide weight gain due to liquid absorption in Tests 2 and 3. Also see Table 5, showing percent weight gains of claimed surface activated nylons.

Appellant also provides a color version of Figures 1-6 filed in the present application. Figures 1 and 2 show the ability of a claimed nylon film to absorb a liquid and transfer components of the liquid to a food product. Figures 3-6 show that the morphology of a claimed nylon film has been permanently changed, which allows for the improved liquid absorption, and the ability of a nylon film to absorb sufficient liquid to effectively transfer components in the liquid to the food product to improve color and/or flavor.

Claims 7 and 12 are specifically directed to a food contact surface (claim 7) in the form of a tubular casing (claim 12). The '520 patent teaches no more than a nylon film that can be used for a casing, but fails to teach or suggest any surface modification. The '762 patent discloses the surface modification of an *external* non-food content surface, and discourages high energy modifications. These claims would not have been obvious over a combination of the '520 and '762 patents for at least the reasons set forth above with respect to the nonobviousness of claim 1 over this combination of references.

For all the above reasons, it is submitted that claims 1-3, 6, 7, 9, 12-15, and 17 would not have been obvious over a combination of the '520 and '762 patents. With respect to the examiner's comments regarding claim 6, the '520 patent fails to teach *any* application of a liquid to the film, let alone 0.4 to 10 mg/cm<sup>2</sup>. With respect to claims 7 and 12, the '762 patent is not remotely directed to an internal food contact surface.

With respect to claims 14, 15, and 17, these are preferred embodiments of the invention, and do not rely solely on the features recited in these claims for patentability, but rely upon the claimed features and *all* of the features recited in claim 1. For the reasons set forth above with respect to claim 1, it is submitted that claims 14, 15, and 17 also are nonobvious over the cited references.

With further respect to claims 14, 15, and 17, and reference to an antiviral agent, applicant respectfully submits that the claim is being construed more broadly than is permissible. During examination, claims are interpreted as broadly as their terms reasonably allow. *In re American Academy of Science Tech Center*, 367 F.3d 1359, 1369, 70 USPQ2d 1827, 1834 (Fed. Cir. 2004). The words of the claim must be given their plain meaning unless applicant has provided a clear definition in the specification. It is submitted that to construe the term antiviral to extend to an agent which has no inherent antiviral properties,



but simply induces eating, goes beyond the plain meaning of the term. Many agents that induce eating are *not* antiviral compounds, e.g., sugar or salt.

First, appellant is claiming that the liquid absorbed into the nylon film can contain an agent that *actively protects against* microbial contamination. A contention that “an ingredient that induces eating is therefore antiviral” has no basis in common sense or fact, and absolutely falls on its face. Sugar induces eating and is not an antiviral agent.

Further, an ingredient that “induces eating” does *not* preclude infection of a food product because food products, and especially those encased in films, are not consumed immediately after preparation, but can be stored, shipped, remain on store shelves, and in remain possession of the purchaser for a substantial time prior to the agent having an ability to “induce eating.” Thus, the food product can be infected prior to or after an arguable inducement to eating occurs.

The examiner’s reliance upon the ‘520 patent teaching transfer of a flavoring agent to a food product is misplaced. The examiner points to column 1, lines 22-26 of the ‘520 patent for this contention. However, this excerpt from the ‘520 patent is not related to transferring of a flavoring agent in a liquid from a nylon film to a food product. This excerpt refers to actual smoke permeability, i.e., a gas, often used to impart color and flavor to a foodstuff. The present invention is not remotely directed to either smoking of a sausage or the gas permeability of a casing.

In view of the above, appellant submits that claims 1-3, 6, 7, 9, 12-15, and 17 would have been obvious over a combination of the ‘520 and ‘762 patent, and that the rejection should be reversed.

## **F. REJECTION OF CLAIM 16**

Claim 16 stands rejected under 35 U.S.C. §103 as being obvious over the Erk et al. ‘520 patent in view of Shimizu et al. ‘762 and further in view of EP ‘957.

### **1. Disclosure of EP ‘957**

EP ‘957 is directed to a packaged product comprising a cooked meat product surrounded by a multilayer film. The first layer contacts the meat product and comprises a

flavor component and a binder comprising a polysaccharide or protein (EP '957, abstract). The first layer can be a polyamide. EP '957 discloses that a "flavor" or "flavorant" is present in the first layer. The "flavor" or "flavorant" can be a sugar, and especially brown sugar (EP '957, paragraph [0042]).

At paragraphs [0105]-[0108], EP '957 discloses film irradiation to promote crosslinking and/or to improve meat adhesion, as known in the art. In the EP '957 patent examples, the food contact surface was treated via corona discharge. The level of energy treatment is not disclosed and, in each example, the food contact polymer is a blend of 70% linear low density polyethylene and 30% ethylene/acrylic acid copolymer, i.e., a blend having hydrophilic properties due to the acrylic acid content. See WO '798, page 10, lines 10-26.

**2. Rejection of Claim 16 under 35 U.S.C. §103 as Being Obvious Over Erk et al. '520 in View of the Shimizu et al. '762 Patent and Further in View of EP '957**

Claim 16 is patentable over a combination of the '520 and '762 patents discussed above in Section IX.E.3. EP '957 fails to cure the deficiencies of these references. EP '957 discloses incorporation of a flavor component and a polysaccharide or protein binder into a layer of a multilayered film for the transfer of the flavor to food. Neither the '520 patent, nor the '762 patent, nor EP '957 teach or suggest incorporating a flavor, for example, into a hydrophobic nylon as claimed, or providing a nylon (as claimed) having *sufficient* surface activation to increase the amount of liquid that the film can absorb.

Therefore, appellant submits that claim 16 is patentable over the combination of the '520 patent, the '762 patent, and EP '957 for the same reasons set forth above with respect to claims 1-3, 6, 7, 9, 12-15, and 17 over a combination of the '520 and '762 patents, and that the rejection should be reversed.

**G. REJECTION OF CLAIMS 45 AND 51-54**

Claims 45 and 51-54 stand rejected under 35 U.S.C. §103 as being obvious over WO '798. The disclosure of WO '798 is disclosed above in Section IX.D.1.

The examiner bases the rejection of claims 45 and 51-54 on the following:

“Beckwith et al disclose a film as discussed above. With regard to Claim 45, Beckwith et al fail to disclose a nylon comprising nylon 6. However, Beckwith discloses a nylon, as stated above, and teaches the use of nylon 6 as a nylon for use in the film (page 18, line 20) and Beckwith teaches blending of nylon with the film (page 12, lines 5-6). It would therefore have been obvious for one of ordinary skill in the art to have provided for nylon 6 as the nylon of Beckwith et al teaches the use of nylon 6 for use in the film.

With regard to Claims 51-54, Beckwith et al fail to disclose a surface activation such that the surface has a watt density of at least 500 w-min/m<sup>2</sup>. However, Beckwith et al disclose an amount of surface activation selected to provide a desired adhesion with a food product (page 13, lines 1-6). It therefore would have been obvious for one of ordinary skill in the art, through routine optimization, to have provided for sufficient surface activation to provide the desired adhesion.” (Office Action of March 13, 2008, page 6)

The examiner’s reasoning is erroneous and flawed.

With respect to claim 45 and 51, these claims depend from claim 1, and appellant submits that claims 45 and 51 are patentable over WO ‘798 for the same reasons that claims 43 and 47-50 are patentable over WO ‘798, as set forth in Section XI.D., above. Furthermore, as fully set forth above, WO ‘798 absolutely fails to teach or suggest a nylon film *consisting of* a nylon and treated with sufficient energy such that the film can absorb more of a liquid after the surface treatment than prior to the surface treatment.

With further respect to claim 45, the examiner relies upon WO ‘798 at page 18, lines 19-20 for a teaching of nylon 6. However, this portion of WO ‘798 refers to the *outer* layer of the film article. This outer layer does *not* contact the food, and is different from the copolymer having hydrophilic and hydrophobic segments of WO ‘798 that does contact the food. WO ‘798 is silent with respect to a polymer *consisting of* a nylon as the food contact layer. WO ‘798 requires the copolymer as disclosed therein, as set forth in Section IX.D.1.

WO ‘798 also discloses that a polyamide can be blended with the copolymer having hydrophilic and hydrophobic segments (WO ‘798, page 12, lines 1-7). However, WO ‘798 fails to teach a food-contact polymer film that is purely a polyamide, as recited in claim 1.

With further respect to claim 51, this claim recites that the surface has been subjected to surface activation such that the surface has a watt density of at least 50 W-min/m<sup>2</sup>. WO ‘798 discloses a corona treatment, but only an amount to improve meat adhesion. WO ‘798,

page 13, lines 1-21. WO '798 fails to teach or suggest the high energy surface treatment recited in claim 51, and appellant submits that claim 51 is patentable over WO '798 for the same reasons claims 43 and 47-50 are patentable over WO '798.

Claims 53 and 54 depend from claim 52. Independent claim 52 is similar to independent claim 1, except for a recitation of at least about 75 W-min/m<sup>2</sup> as the amount of energy applied to the surface of the nylon film. Claim 53 recites that the surface receives energy of a watt density of up to about 500 W-min/m<sup>2</sup>. The high amount of energy recited in claim 52 allows the treated nylon to absorb a liquid up to about one-half the thickness of the nylon film (claim 54).

The examiner admits that WO '798 fails to disclose a watt density of "at least 500 W-min/m<sup>2</sup>". However, the examiner also would be correct in stating that WO '798 fails to even disclose a watt density of at least 75 W-min/m<sup>2</sup>. The examiner considers this amount of energy to be an optimization to provide a desired adhesion. This contention is unfounded and erroneous.

WO '798 explicitly teaches that a high degree of surface activation should be avoided to avoid excess adhesion, particularly with a polyamide casing material. As stated in the present specification at page 8, lines 26-30.

"Polyamide casing materials which have a surface energy in the order of up to about 45 dynes generally have sufficient meat adherent properties and corona treatment is not required. It is believed that if a polyamide was corona treated, the resulting film would adhere excessively to a meat surface, causing the above-mentioned problems."

The above disclosure clearly teaches that persons skilled in the art understand that the surface energy of a *polyamide* should *not exceed* 45 dynes. It is submitted, therefore, that WO '798 fails to teach or suggest a high total energy surface treatment of at least about 75 W-min/m<sup>2</sup> of a hydrophobic polyamide, or to provide a nylon film consisting of amide groups *only*, as claimed in claim 52, which is permanently altered in structure and has an improved capability to absorb liquids. The present specification shows that a watt density of about 76 W-min/w<sup>2</sup> provides a nylon film having a dyne level of about 55 (page 17, Table 2).

Contrary to the contentions of the examiner, raising the degree of surface energy treatment as recited in claims 52-54 would not have been expected to optimize adhesion. The art specifically teaches that such a high amount of energy activation would be *harmful*. Surprisingly and unexpectedly, the claimed high amount of surface energy applied provides an enhanced ability to absorb liquids and transfer components of the liquid to a food product. This enhanced ability to absorb a liquid is attributed to permanent change in surface morphology caused by the high amount of applied energy.

Therefore, appellant submits that claims 45 and 51-54 are patentable over WO '798 for the reasons set forth above and in Section IX.D., above.

#### **H. CLAIM 55**

The Office Action indicates that claim 55 is pending in the application and is rejected. However, claim 55 is not specifically included in any of the obviousness rejections set forth in the Office Action. Due to the confusing nature of the Office Action, appellant is unable to determine in which specific rejection claim 55 should be included.

However, regardless of a specific rejection, it is submitted that claim 55 is patentable over all of the cited references, alone or in combination, for the reasons that other pending claims 1-3, 6, 7, 12-17, 43, 45, and 47-54 are patentable over the cited references.

In particular, claim 55, which depends from claim 1, recites a surface dyne level of at least 70 dynes. No cited reference teaches or suggest this high surface energy activation, and actually discourages such high activation because of excess meat adhesion.

Therefore, appellant submits that claim 55 is patentable over the cited references for all the reasons set forth above in Sections IX.D.2., IX.E.3., IX.F.2., and IX.G, and that the rejection should be reversed.

## **I. RESPONSE TO EXAMINER'S ANSWERS TO APPLICANT'S ARGUMENTS**

At pages 7-9 of the Office Action of March 13, 2008, the examiner responds to arguments made in Amendment "D," filed February 4, 2008. Appellant now addresses the examiner's answers.

(a) "Applicant argues, on page 10 of the remarks dated February 4, 2008, that the claimed nylon film differs from the nylon film of WO 97/36798 in that the claimed nylon is not a block copolymer.

However, a nylon that is a block copolymer is not excluded by the claimed invention."

The claimed nylon *consists of* monomer (a), (b), or (c), or a mixture of the monomers. *All* of the monomers provide a nylon, alone or in combination. The claimed nylon contains *no* monomers that would provide the hygroscopic segments of the block copolymer of WO '798. Even if two monomers of (a), (b), and (c) were copolymerized in way to provide a block copolymer, it *still* would be different from the copolymer of WO '798. The claimed nylon, by the recitation of *consisting of*, excludes the hygroscopic segments of the WO '798 *and* other polymers.

(b) "Applicant also argues, on page 11, that the nylon of the claimed invention has liquid absorbed and is permanently modified.

However, WO 97/36798 has liquid absorbed; furthermore, a film that is permanently modified is not claimed."

The permanent modified film claimed in two ways. First, by the surface energy of the film (e.g., claim 1) or by the total amount energy applied to the film (e.g., claim 52). It is the high applied energy that permanently modifies the film. Second, the claims recite that the film absorbs more of a liquid after the energy treatment than before the energy treatment. How can the treated nylon film absorb more of a liquid than untreated nylon film unless it is permanently modified?

(c) "Applicant also argues, on page 14, that the liquid disclosed in WO 9736798 is absorbed only in portions of the polymer that do not comprise nylon.

However, as stated above, a nylon that is a block copolymer is not excluded by the claimed invention; furthermore, the liquid disclosed is at least partially absorbed in a nylon copolymer and is therefore absorbed in a nylon.”

The above is not appellant’s argument, but *is* disclosed in WO ‘798. See WO ‘798, page 8, line 3 through page 9, line 2. WO ‘798 fails to disclose liquid absorption by the water-insoluble segments, but includes hygroscopic segments to perform these functions. In fact, even if a claimed nylon is a block copolymer, it is a block copolymer *consisting of* only amide units that make up a nylon. The liquid absorbed by a nylon copolymer of WO ‘798 is absorbed by the hygroscopic segments, as disclosed in WO ‘798, not the water insoluble, e.g., nylon, segments.

(d) “Applicant also argues, on page 15, that the claim limitation of a film that absorbs more liquid than a film that has not been surface activated should be given patentable weight although it is functional language; functional language, Applicant argues, is well-known to be permissible in claims.

However, Applicant has not stated why the claim limitation is a structural limitation, and should therefore be given little patentable weight.”

This response by the examiner is fully addressed in Section IX.D.2., above.

(e) “Applicant also argues, on page 16, that WO 97/36798 fails to teach modification of the physical properties of the water-insoluble segment.

However, as stated above, the liquid disclosed is at least partially absorbed in a nylon copolymer and is therefore absorbed in a nylon.”

As fully discussed above, the liquid is absorbed in the hygroscopic segments of the WO ‘798 copolymer. The claimed nylon differs substantially from the copolymer of WO ‘798. WO ‘798 still fails to teach modification of the physical properties of the water-insoluble segment.

(f) “Applicant also argues, on page 17, that the films exemplified WO 97/36798 are not corona treated.

However, WO 97/36798 is not limited to the exemplified films.”

WO '798 fails to teach or suggest the drastic, high energy treatment recited in the present claims. It is the high energy treatment that allows a claimed nylon to absorb greater amounts of a liquid. WO '798 fails to provide any apparent reason to apply a high amount of energy because the copolymer of WO '798 *already* contains hygroscopic segments so there is no incentive to increase the absorption properties of the film. Further, it is a standard in the art *not* to corona treat a nylon film to greater than 45 dynes because of excessive adhesiveness to encased meat. See specification, page 8, lines 26-30.

(g) "Applicant also argues, on page 18, that WO 97/36798 does not disclose absorption through the entire thickness of the nylon, because the water insoluble segments do not absorb water.

However, it is unclear why water would not be absorbed through the thickness of the other segments of the nylon."

Appellant fails to see where WO '798 discloses absorption throughout the thickness of the film. Nevertheless, if the liquid is absorbed through the thickness, it is because of the hygroscopic segments, which are absent and excluded from the claimed nylon. If the liquid is absorbed through the copolymer of WO '798, it is irrelevant because it is a *completely different* film.

(h) "Applicant also argues that the nylon disclosed by WO 97/36798 does not consist only of amide units, as stated in the previous Action.

However, it is unclear where, in the previous Action, it is stated that the nylon disclosed by WO 97/36798 consists only of amide units."

Regardless of where such a statement can be found, the fact is that the copolymer disclosed in WO '798 does not consist only of amide units. How can the examiner issue an anticipation rejection under 35 U.S.C. §102(b) unless he considers the copolymer of WO '798 to consist only of amide units?

(i) "Applicant also argues, on page 19, that Applicant has previously quoted the teaching of WO 97/36798 that a polyamide should have a surface energy of not more than 45 dynes.

However, the location of the quote is not clear."



Appellant erred in making this statement. The teaching is found at page 8, lines 26-30 of the present specification.

(j) “Applicant also argues, on page 21, that WO 97/36798 states that absorption of water decreases the integrity of a polymer, because WO 97/36798 states that *water insoluble segments of the copolymer prevent the food contact layer from being solubilized and the water insoluble segments serve to anchor the hygroscopic portions to the rest of the copolymer and thereby maintain the integrity of the food contact layer during cook in.*

However, this statement does not include an explicit statement regarding polymer integrity.” (Emphasis added)

Appellant is confused by the point the examiner is attempting to make. The above italicized portion of the examiner’s response is not purely appellant argument, it is taken *directly* from WO ‘798. See WO ‘798, page 8, line 27 through page 9, line 2.

(k) Applicant also argues that the statement that an ingredient that induces eating is an antiviral is incorrect; sugar induces eating and is not an antiviral, Applicant argues, and does not actively protect against microbial infection.

However, most foods contain sugar, and also provide actively against microbial infection; furthermore, active protection is not claimed.

Arguments relating to “inducing eating” equating to the including of an antiviral agent in the absorbed liquid have been addressed in Section IX.D.2., above. Although most foods may contain sugar, the sugar provides no active antimicrobial activity. Active antimicrobial protection *is* recited in the present claims, i.e., by including an active antimicrobial agent in the liquid to be adsorbed, one is actively protecting against microbial infection.

(l) “Applicant also argues, on page 23, that Shimizu states that corona discharge is unnecessary.

However, the teaching that corona discharge is unnecessary is not the same as a teaching away from corona discharge.”

A teaching that corona discharge is not necessary suggests to persons skilled in the art that the corona discharge step can be omitted or used at levels typically used in the art. It definitely fails to teach or suggest to a person skilled in the art to use corona discharge at a

high level (as claimed) which is *avoided* in the art due to excessive adhesiveness. Further, the '762 patent teaches no more than a *low* corona discharge, i.e., "for strength of corona discharge, 30 W-min/m<sup>2</sup> or less is appropriate" (column 3, lines 1-3). This excerpt from the '762 patent clearly teaches away from the claimed high degree of corona discharge, e.g., at least 50 W-min/m<sup>2</sup> (claim 51), at least 75 W-min/m<sup>2</sup> (claim 52), and up to 500 W/min-m<sup>2</sup> (claim 53).

(m) "Applicant also argues, on page 24, that surface treatment is not disclosed by Shimizu. However, surface treatment is disclosed by WO 97/36798, as stated above."

Not one of the present rejections cite a combination of WO '798 and the '762 patent.

(n) "Applicant also argues, on page 25, that the intensity of corona treatment in the claimed invention is greater than the corona treatment of the prior art.

However, as stated on page 2 of the previous Action, both the claimed film and the prior art film have dyne levels of at least 50 dynes."

WO '798 suggests a dyne level of greater than 50 dynes for the block copolymer discussed in WO '798. WO '798 does not suggest a high dyne level for a purely nylon film, and the art discourages a high corona treatment of a purely nylon film.

(o) "Applicant also argues, on page 27, that the claimed invention is against excessive adhesiveness.

However, the lack of excessive adhesiveness is not claimed."

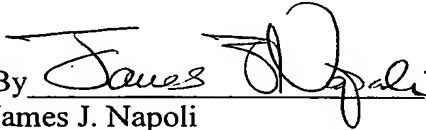
The present invention is not directed to overcoming excessive adhesiveness. The present invention is directed to increasing liquid absorption properties of a purely nylon film. This is accomplished by the application of energy levels much higher than are used in the art. In particular, the art uses a low corona discharge to improve film adhesiveness and avoids a high corona discharge because of excessive adhesiveness. Appellant found that contrary to standards in the art, the application of a high amount of energy did not destroy the film, but improved the liquid absorption properties of the film. As a secondary benefit, appellant found that the adhesiveness of the treated film to a packaged food product was not excessive.

**X. CONCLUSION**

In view of the foregoing remarks, appellants respectfully request that the Board reverse the final rejection of claims 1-3, 6, 7, 12-17, 43, 45, and 47-55, and that all pending claims should be allowed.

Dated: December 9, 2008

Respectfully submitted,

By   
James J. Napoli

Registration No.: 32,361  
MARSHALL, GERSTEIN & BORUN LLP  
233 S. Wacker Drive, Suite 6300  
Sears Tower  
Chicago, Illinois 60606-6357  
(312) 474-6300  
Attorney for Applicant

## **CLAIMS APPENDIX**

1. (Previously presented) A nylon film consisting of (a) one or more aliphatic primary diamine and one or more aliphatic dicarboxylic acid, (b) an omega-aminocarboxylic acid, (c) an omega-aminocarboxylic lactam, or (d) a mixture of two or three of (a), (b), and (c), and having a liquid at least partially absorbed therein, wherein the liquid has been applied to a surface of the nylon film and prior to application of the liquid to the surface, the surface has been surface activated such that the surface has a dyne level of at least about 50 dynes and the amount of liquid able to be absorbed by the nylon film after said surface activation is higher than the amount able to be absorbed before said activation.

2. (Previously presented) The film of claim 1, wherein the surface is activated by plasma treatment, flame treatment, corona discharge, UV irradiation, electron beam irradiation, or gamma irradiation.

3. (Previously presented) The film of claim 1, wherein the surface is activated by corona discharge.

4. (Cancelled)

5. (Cancelled)

6. (Original) The film of claim 1, wherein the liquid has been applied to the surface in an amount of between about 0.4 to about 10mg/cm<sup>2</sup>.

7. (Previously presented) The film of claim 1, in the form of a food packaging film, whereby in use the surface is a food contact surface.

8. (Cancelled)

9. (Cancelled)

10. (Cancelled)

11. (Cancelled)

12. (Previously presented) The film of claim 7, in the form of a tubular casing.

13. (Previously presented) The film of claim 1, wherein the liquid consists essentially of water.

14. (Previously presented) The film of claim 1, wherein the liquid is a composition comprising at least one additive for transfer to a packaged food product.

15. (Previously presented) The film of claim 14, wherein the additive is selected from the group consisting of a coloring agent, a flavoring agent, and a coloring and flavoring agent.

16. (Original) The film of claim 15, wherein the additive comprises a Maillard reagent.

17. (Previously presented) The film of claim 1, wherein the liquid includes an agent selected from the group consisting of an antimicrobial agent, a fungicide, or an anti-viral agent.

18. (Cancelled)

19. (Cancelled)

20. (Cancelled)

21. (Cancelled)

22. (Cancelled)

23. (Cancelled)

24. (Cancelled)

25. (Cancelled)

26. (Cancelled)

27. (Cancelled)

28. (Cancelled)

- 29. (Cancelled)
- 30. (Cancelled)
- 31. (Cancelled)
- 32. (Cancelled)
- 33. (Cancelled)
- 34. (Cancelled)
- 35. (Cancelled)
- 36. (Cancelled)
- 37. (Cancelled)
- 38. (Cancelled)
- 39. (Cancelled)
- 40. (Cancelled)
- 41. (Cancelled)
- 42. (Cancelled)
- 43. (Previously presented) The film of claim 1 having a second polyolefin layer.
- 44. (Cancelled)
- 45. (Previously presented) The film of claim 1, wherein the nylon is nylon 6.
- 46. (Cancelled)
- 47. (Previously presented) The film of claim 43 having a third outer nylon layer.
- 48. (Previously presented) The film of claim 47, wherein the outer nylon layer is  
nylon 66.

49. (Previously presented) The film of claim 1, wherein the liquid is absorbed to a depth of up to about one-half of a thickness of the nylon surface layer.

50. (Previously presented) The film of claim 1, wherein the liquid is absorbed to a depth of up to about 5 microns of a thickness of the nylon surface layer.

51. (Previously presented) The film of claim 1, wherein the surface layer is subjected to a surface activation treatment such that the surface has a watt density of at least 50 w-min/m<sup>2</sup>.

52. (Previously presented) A nylon film consisting of (a) one or more aliphatic primary diamine and one or more aliphatic dicarboxylic acid, (b) an omega-aminocarboxylic acid, (c) an omega-aminocarboxylic lactam, or (d) a mixture of two or three of (a), (b), and (c), and having a liquid at least partially absorbed therein, wherein the liquid has been applied to a surface of the nylon film and prior to application of the liquid to the surface, the surface has been surface activated by the application of energy such that the surface receives energy of a watt density of at least about 75 W-min/m<sup>2</sup> and the amount of liquid able to be absorbed by the nylon film after said surface activation is higher than the amount able to be absorbed before said activation.

53. (Previously presented) The nylon film of claim 52, wherein the surface receives energy of a watt density of up to about 500 W-min/m<sup>2</sup>.

54. (Previously presented) The nylon film of claim 52, wherein the liquid is absorbed up to about one-half of a thickness of the nylon film.

55. (Previously presented) The film of claim 1 wherein the surface has a dyne level of at least 70 dynes.

**EVIDENCE APPENDIX**

- A. DEFINITION AND EXAMPLES OF BLOCK COPOLYMERS**
- B. FIGURES OF U.S. PATENT APPLICATIONS NO. 10/798,462**



**A. DEFINITION AND EXAMPLES OF BLOCK COPOLYMERS**

# *Hawley's Condensed Chemical Dictionary*

**ELEVENTH EDITION**

*Revised by*

**N. Irving Sax**

**and**

**Richard J. Lewis, Sr.**



**VAN NOSTRAND REINHOLD COMPANY**

**New York**

Copyright © 1987 by Van Nostrand Reinhold Company Inc.

Library of Congress Catalog Card Number: 86-23333  
ISBN: 0-442-28097-1

All rights reserved. Certain portions of this work copyright © 1930, 1920, 1919 by The Chemical Catalog Co., Inc. and 1981, 1977, 1971, 1966, 1956, 1950 by Van Nostrand Reinhold Company Inc. No part of this work covered by the copyright hereon may be reproduced or used in any form or by any means—graphic, electronic, or mechanical, including photocopying, recording, taping, or information storage and retrieval systems—without permission of the publisher.

Printed in the United States of America

Van Nostrand Reinhold Company Inc.  
115 Fifth Avenue  
New York, New York 10003

Van Nostrand Reinhold Company Limited  
Molly Millars Lane  
Wokingham, Berkshire RG11 2PY, England

Van Nostrand Reinhold  
480 Latrobe Street  
Melbourne, Victoria 3000, Australia

Macmillan of Canada  
Division of Canada Publishing Corporation  
164 Commander Boulevard  
Agincourt, Ontario M1S 3C7, Canada

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

#### Library of Congress Cataloging-in-Publication Data

Condensed chemical dictionary.  
Hawley's condensed chemical dictionary.

Rev. ed. of: The Condensed chemical dictionary.  
10th ed./rev. by Gessner G. Hawley, 1981.  
I. Chemistry—Dictionaries. I. Hawley, Gessner  
Goodrich, 1905— II. Sax, N. Irving (Newton Irving)  
III. Lewis, Richard J., Sr. IV. Title.  
QD5.C5 1987 540'.3'21 86-23333  
ISBN 0-442-28097-1

minerals with a  
um beds and on  
e are usually pres-  
r minerals.

ate).

$\beta$ -oxoesters by  
ic esters with zinc  
i mediate or-  
th nitrile and  
h 30% potassium

m. Introduction  
t gs on treat-  
ty...chloric acid  
e.

elization of dicar-  
acetic anhydride  
s or ketones de-  
cations of the car-  
acids give anhy-  
ie carboxy groups  
positions give ke-

sulfate.

or fruits in either  
n preparation for  
nd temperatures  
her the tempera-  
d. The operation  
present, tends to  
s the volume. It  
value, especially

dispersing agent  
of a sulfonated  
ative.

nts, earths, and  
n insecticide for-  
y for slime con-  
pitch, reducing  
ng, etc.; in the  
dispersing, level-

whitening  
e used as whit-  
ate rayon, and  
ene derivatives  
and rayon fab-  
id industrial de-

"Blandol."<sup>45</sup> TM for white mineral oil (NF).  
Use: Pharmaceutical and cosmetic formulations,  
plasticizers, paper penetrants, foam depressants.

**blank.** (1) A piece of material of any desired shape  
cut by a stamping die prepared for further pro-  
cessing. (2) See control (1).

**blast furnace.** A vertical coke-fired furnace used  
for smelting metallic ores, e.g., iron ore.

**blast-furnace gas.** Byproduct gas from smelting  
iron ore obtained by the passage of hot air over  
the coke in the blast furnaces. A typical gas will  
analyze 12.9% carbon dioxide, 26.3% carbon  
monoxide, 3.7% hydrogen, 57.1% nitrogen.  
Hazard: Toxic by inhalation. See carbon monox-  
ide.

Use: Heating blast-furnace stoves, boiler, or gas-  
engine fuel.

**blasting agent.** See black powder; ammonium ni-  
trate; explosive, high, permissible, and low.

**blasting gelatin.** (SNG). A type of gelatinized  
dynamite containing approximately 7% of nitro-  
cellulose.

Hazard: High explosive.

**blasting powder.** See black powder.

"B-I-E."<sup>44</sup> TM for high-temperature reaction  
product of diphenylamine and acetone.  
Properties: Dark-brown, viscous liquid; d 1.087;  
soluble in acetone, benzene, and ethylene dichlo-  
ride; insoluble in gasoline and water. Combusti-  
ble.

Use: General-purpose rubber antioxidant.

**bleach.** To whiten a textile or paper by chemical  
action. Also the agent itself. Bleaching agents  
include hydrogen peroxide (the most common),  
sodium hypochlorite, sodium peroxide, sodium  
chlorite, calcium hypochlorite, hypochlorous  
acid, and many organic chlorine derivatives.  
Chlorinated lime is a bleaching powder used on  
an industrial scale. Household bleaching powders  
are sodium perborate and dichlorodimethylhy-  
dantoin.

Hazard: See calcium hypochlorite; lime, chlori-  
nated. Some bleaching agents are toxic and  
strong oxidizing agents.

**bleaching assistant.** A material added to bleach-  
ing baths to secure more rapid and complete pen-  
etration of the bleach or improved regulation  
of the bleaching action, e.g., compounds of sulfo-  
nated oils and solvents, soluble pine oils, fatty  
alcohol salts, sodium silicate, sodium phosphate,  
magnesium sulfate, and borax.

**bleach liquor.** A solution of calcium hypochlorite  
and water.

**bleed.** (1) When a dye runs. (2) To release pres-  
sure gradually as via a valve.

**blend.** A uniform combination of two or more  
materials either of which could be used alone  
for the same purpose as the blend. For example,  
a fabric may be a blend of wool and nylon either  
of which is itself usable as fabric. Instances of  
materials that are often blended are:

plastics (polyblends)	grains
whiskeys	coffees
fabrics	paints
colors	tobaccos
metal powders	solvents
fertilizers	

See also mixture, mixing, kneading.

"Blendex."<sup>425</sup> TM for synthetic resinous products  
prepared from a variety of copolymer combina-  
tions. They are used to modify other polymers  
to attain a wide range of properties.

**bleomycin.** A glycopeptide antibiotic produced by  
*Streptomyces verticillus*. It functions as an anti-  
neoplastic and diagnostic agent. The molecule  
is exceedingly complex, but synthesis was  
achieved in 1982. It is a colorless to yellowish  
powder, soluble in water and methanol but in-  
soluble in acetone and ether. It induces rupture  
of DNA strands.

**blinding.** (blister copper).  
Properties: Copper (96-99% purity) produced by  
the reduction and smelting of copper ores. It  
has a blistered appearance probably caused by  
gas pockets. It is usually further refined electro-  
lytically.

**blister gas.** See dibromodiethylsulfide.

**blister packaging.** A type of packaging used  
widely in the food and pharmaceutical industries  
consisting of a hollow cavity of various shapes  
and capacities in which the material is enclosed.  
Polyester and polyethylene resins are often used.

**block.** (1) Undesirable cohesion of films or layers  
of plastic.

See antiblock agent.

(2) A type of polymer.

See block polymer.

**block polymer.** A high polymer whose molecule  
is made up of alternating sections of one chemical  
composition separated by sections of a different

chemical nature or by a coupling group of low molecular weight. An example might be blocks of polyvinyl chloride interspersed with blocks of polyvinyl acetate. Such polymer combinations are made synthetically. They depend on the presence of an active site on the polymer chain which initiates the necessary reactions.

See also graft polymer, stereoblock polymer.



**blood.** A complex, liquid tissue of d 1.056 and pH 7.35-7.45. It is comprised of erythrocytes (red cells), leucocytes (white cells), platelets, plasma, proteins, and serum. The plasma fraction (55-70%) is whole blood from which the red and white cells and the platelets have been removed by centrifuging. Hemoglobin is a protein found in the erythrocytes. It contains the essential iron atom and functions as the transport agent for oxygen to the heart (artery) and of carbon dioxide from the heart (vein). Experimental work has been reported on the effectiveness of fluorocarbon compounds in carrying out the essential transport functions of blood, especially of the red cells.

**Use:** Plasma is used to restore liquid volume and thus osmotic pressure in the body where blood loss has been extensive. Animal blood is used as a component of adhesive mixtures. In dried or powder form it is a component of fertilizers poultry feeds and deer repellents.

See also hemoglobin, plasma, platelet, rhesus factor.

**bloom.** (1) A thin coating of an ingredient of a rubber or plastic mixture that migrates to the surface usually within a few hours after curing or setting. Sulfur bloom in vulcanized rubber products is most common; it is harmless but impairs the eye appeal of the product. Paraffin wax is often included purposely; when it migrates to the surface it provides an efficient barrier to sun-checking and oxidation.

(2) A piece of steel made from an ingot.

(3) An arbitrary scale for rating the strength of gelatin gels. When so used the word is capitalized.

(4) Efflorescence of phytoplankton in sea water causing discoloration of the surface water. See red tide.

**blowing agent.** A substance incorporated in a mixture for the purpose of producing a foam. One type decomposes when heated to processing temperature to evolve a gas, usually carbon dioxide, which is suspended in small globules in the mixture. Typical blowing agents of this kind are baking powder (bread and cake), sodium bicarbonate or ammonium carbonate (cellular or sponge rubber), halocarbons and methylene chloride in urethane, pentane in expanded polystyrene, hydrazine and related compounds in various types of foamed plastics. Another type is air used at room temperature as a blowing agent for rubber latex; it is introduced mechanically by whipping, after which the latex is coagulated with acid. Air is also used for this purpose in ice cream, whipped cream, and other food products, as well as in blown asphalt and blown vegetable oils.

See also foam.

**blow molding.** A technique for production of hollow thermoplastic products. It involves placing an extruded tube (parison) of the thermoplastic in a mold and applying sufficient air pressure to the inside of the tube to cause it to take on the conformation of the mold. Polyethylene is usually used but a number of other materials are adaptable to this method, e.g., cellulose, nylons, polypropylene, and polycarbonates. It is an economically efficient process and is especially suitable for production of toys, bottles, and other containers as well as air-conditioning ducts and various industrial items. The method is not limited to hollow products; e.g., housings can be made by blowing a unit and sawing it along the parting line to make two housings.

**blown asphalt.** See asphalt, blown.

**blown oil.** (oxidized oil; base oil; thickened oil; polymerized oil). Vegetable and animal oils which have been heated and agitated by a current of air or oxygen. They are partially oxidized, deodorized, and polymerized by the treatment and are increased in density, viscosity and drying power. Common blown oils are castor, linseed, rape, whale and fish oils.

**Use:** Paints, varnishes, lubricants, and plasticizers.

**blue copperas.** See copper sulfate.

**blue cross gas.** See diphenylchloroarsine.

**blue gas.** See water gas.

**blue lead.** See lead sulfate, blue basic.

**blueprint.** See Turnbull's Blue.

**blue verdigris.** See copper acetate, basic.

**blue vitriol.**

**blush.** Pre of colloid or lacquerature due to so slightly avoided b

**board.** See

**BOD.** See

**body.** (1) A nymous descriptive seed oil w See also cor (2) In bio present in See agglutir (3) An obje e.g., black

**Bodroux-Chi** mation of mates with

**Bodroux-reac** ides by reac ester with by treatme with a Gri

**Boeseken's m** configurati ducing anc sugar. Bori droxyl groi electrical c hanced. Sin trans-hydr ity is obser

**Bogert-Cook** nylethylmaj nones follo tiary alcoho formation o and a small

**boghead coal.** minous coa ance and be ized by a h volatile mai tionally hig

DITOR  
ic. litz

DR  
-Grant

KIRK-OTHMER

# ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY

FOURTH EDITION

VOLUME 7

COMPOSITE MATERIALS  
TO  
DETERGENCY



A Wiley-Interscience Publication  
**JOHN WILEY & SONS**

New York • Chichester • Brisbane • Toronto • Singapore

This text is printed on acid-free paper.

Copyright © 1993 by John Wiley & Sons, Inc.

All rights reserved. Published simultaneously in Canada.

Reproduction or translation of any part of this work beyond that permitted by Sections 107 or 108 of the 1976 United States Copyright Act without the permission of the copyright owner is unlawful. Requests for permission or further information should be addressed to the Permissions Department, John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158-0012.

**Library of Congress Cataloging-in-Publication Data**

Encyclopedia of chemical technology / executive editor, Jacqueline I. Kroschwitz; editor, Mary Howe-Grant. — 4th ed.  
p. cm.

At head of title: Kirk-Othmer.

"A Wiley-Interscience publication."

Includes index.

Contents: v. 7. Composite materials to detergency.

ISBN 0-471-52675-4 (v. 7)

I. Chemistry, Technical—Encyclopedias. I. Kirk, Raymond E. (Raymond Eller), 1890–1957. II. Othmer, Donald F. (Donald Frederick), 1904–. III. Kroschwitz, Jacqueline I., 1942–.

IV. Howe-Grant, Mary, 1943–. V. Title: Kirk-Othmer encyclopedia of chemical technology.

TP9.E685 1992

660'.03—dc20

91-16789

Printed in the United States of America

10 9 8 7 6 5 4 3 2 1

Com  
Com  
Ma  
Comp  
(C/  
Comp  
Conta  
Contri  
Contri  
Tec  
Conve  
Coordi  
Copoly  
Coppe  
Copper  
Copper  
Copyrig  
Corrosi  
Conti  
Cosmet  
Cotton  
Coumar  
Cryoger

equipment for oil and gas production and chemical processing. U.S. consumption in 1988 was 3100 t (76).

### Alternating Copolymers

Poly(styrene-*alt*-maleic anhydride) [9011-13-6] is a classic and commercial example of an alternating copolymer (77). This material is manufactured by free-radical bulk, solution, or emulsion copolymerization. Important producers are ARCO (SMA) and Monsanto (Lytron). Such copolymer resins are brittle and insoluble in most solvents. But they are soluble in alkaline solution and react with water to give acids, with alcohols to give esters, and with amines to give amides. They can be converted to insoluble, infusible thermosets by heating with diamines or glycols. These resins and their derivatives are seldom used alone but are used as dispersants (to increase the pigment concentration) and floor polishes (to act as emulsifiers and protective colloids). Maleic anhydride can also form alternating copolymers with various olefins (EMA Resin, Monsanto) and vinyl ethers (Gantres An-Resin, General Aniline and Film Corp.).

Maruzen Oil Co. has developed various Ziegler-Natta catalysts that can produce poly(butadiene-*alt*-propylene) (PBR) (78). PBR shows tack (self-adhesion) and green (unvulcanized) dynamic properties superior to those of BR and EPDM. Carbon black-loaded vulcanizates can be compounded to give high strength and elongation at break (79,80). PBR can also be covulcanized with SBR, BR, and EPDM.

### Block Copolymers

Block copolymers have become commercially valuable commodities because of their unique structure-property relationships. They are best described in terms of their applications such as thermoplastic elastomers (TPE), elastomeric fibers, toughened thermoplastic resins, compatibilizers, surfactants, and adhesives (see ELASTOMERS, SYNTHETIC—THERMOPLASTIC).

A thermoplastic elastomer is a material that combines the processability of a thermoplastic with the performance of a thermoset rubber. A thermoplastic elastomer (81) results when block copolymers have an ABA, (AB)<sub>n</sub>X, or -(AB)<sub>n</sub>-, but not an AB diblock arrangement of A (thermoplastic) and B (rubbery) blocks. The hard A blocks may be glassy (eg, polystyrene) or crystalline (eg, polyester, polyurethane); the soft B blocks must be elastomeric (eg, polybutadiene, polyisoprene, polyether). When the hard segments are incompatible with the soft segments, the domains or regions of hard blocks act as reinforcing physical cross-links for the rubbery matrix. In contrast to chemically cross-linked rubbers, the physical network is thermally reversible. When the polymer is heated above the  $T_g$  (or  $T_m$ ) of the hard block, the hard blocks soften and allow the rubber to flow and to be processed as a thermoplastic. Table 4 shows some commercially important TPE block copolymers and their producers.

The manufacture of block copolymer TPE depends on the type and arrangement of the blocks. For example, butadiene-styrene ABA, (AB)<sub>n</sub>X block copoly-

mers a  
Therm  
copoly  
col and  
duced  
glycols  
TI  
arrang  
block c  
TI  
their n  
have fo  
truded  
adhesiv  
of styre  
been a

Table 4.

Comonomer

styrene-  
styrene

urethane

ester-ester

<sup>a</sup>Ref. 82.

Table 5.

Property

tensile  
recovery  
upper us  
lower us  
aging sta  
acid-bas  
oil resist  
electrical  
abrasion  
melt pro  
cost

<sup>a</sup>Ref. 83.

<sup>b</sup>A design



mers are conveniently prepared by alkyllithium initiated anionic polymerization. Thermoplastic  $\text{-(AB)}_n$  polyurethanes are synthesized by step-growth addition copolymerization of dihydroxy compounds such as polytetramethylene ether glycol and toluene diisocyanate. The copolyester-ether  $\text{(AB)}_n$  copolymers are produced by the polycondensation of dicarboxylic acids (eg, terephthalic acid) with glycols or polyether glycols.

The physical properties of block copolymer TPE also depend on the type and arrangement of the blocks. Table 5 compares the property advantages of various block copolymer thermoplastic elastomers.

The properties and prices of the various block copolymer TPE greatly affect their markets. For example, the low cost butadiene-styrene block copolymers have found utility in footwear (sneakers, tennis shoes), injection-molded or extruded goods (automotive sight shields, fender extensions, toys, housewares), and adhesives (solvent cement and hot-melt types). The principal commercial supplier of styrenic block copolymers is Shell (Kraton). In addition, two joint ventures have been announced to produce these materials. Dow Chemical and Exxon have

**Table 4. Commercially Important Block Copolymer TPE<sup>a</sup>**

Comonomer	Block arrangement	Trade name	Producer
styrene-diene (hydrogenated styrene-diene)	ABA, $\text{(AB)}_n\text{X}$	Kraton	Shell
urethane-ester (ether)	$\text{-(AB)}_n$	Vector Estane	Dexco B. F. Goodrich
ester-ether	$\text{-(AB)}_n$	Texin Hytrel	Mobay Du Pont

<sup>a</sup>Ref. 82.

**Table 5. Property Advantages of Various Block Copolymer TPE<sup>a,b</sup>**

Property	Styrene-diene	Hydrogenated styrene-diene	Ester-ether	Urethane-ester
tensile				
recovery	+	+	+	+
upper use temperature				
lower use temperature	+	+	+	+
aging stability		+		
acid-base resistance	+	+		
oil resistance		+		
electrical	+	+	+	+
abrasion resistance				
melt processability				+
cost	+		+	+

<sup>a</sup>Ref. 83.

<sup>b</sup>A designation of + indicates a performance strong point.

formed Dexco Polymers to produce systemic block copolymers for pressure-sensitive adhesive, asphalt (qv), and thermoplastic impact modifier markets. The second joint venture is EnArco, formed by ARCO Chemical Co. and Enimont. This venture will produce products for similar applications (84). The U.S. consumption of these materials as of 1989 was 139,000 t (85). These materials typically possess a high volume fraction of styrene and are priced between the low cost resins, polystyrene, polyethylene, etc and the high cost resins, cellulosic, clear ABS, polycarbonates, etc. These same materials are used as compatibilizers and impact modifiers in polymer blends. Here, they lower surface tension, decreasing domain size in two-phase blends, usually resulting in improved properties, such as impact strength and flexural modulus.

Polyurethane TPE exhibit toughness, low temperature flexibility, strength, and abrasion resistance. They are produced using a bulk or solution reaction of a polyol with a diisocyanate and are used largely in fabric coatings and injection molded and extruded goods (exterior automotive parts, gears, gaskets, etc). Important commercial producers include BASF (Elastollan), Bayer (Desmopan), Dow Chemical (Pellethane), and B. F. Goodrich (Estane). U.S. production is estimated at 21,000 t (86).

In contrast, the copolyester-ether block copolymer TPE are relatively expensive with high performance characteristics. These materials exhibit a two-phase morphology in which the hard crystalline segments made from polyester act as thermally reversible cross-links. The elastomeric character of the polymer arises from the amorphous soft polyether ester segments. They are produced by a melt-transesterification polymerization process and can be processed by conventional techniques such as injection, blow, transfer, or rotational molding. Important commercial products are produced by Du Pont (Hytrel), Eastman Kodak (Ecdel), General Electric (Lomod), and Hoechst Celanese (Riteflex). U.S. copolyester-ether consumption in 1988 was 12,000 t. Their most important uses are in wire cable materials (eg, the coiled stretch telephone cords), injection-molded articles (eg, small mechanical parts), and high pressure hoses (87).

Certain block copolymers have also found application as surfactants (88). For example, AB or ABA block copolymers in which one block is hydrophilic and one block is hydrophobic have proven useful for emulsifying aqueous and non-aqueous substances and for wetting the surface of materials. Examples of such surfactants are the poly(propylene oxide-*block*-ethylene oxide) materials, known as Pluronic (BASC Wyandotte Co.).

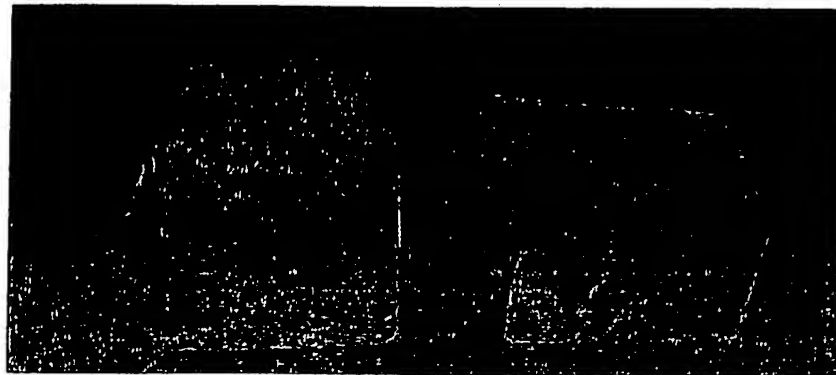
### Graft Copolymers

Two commercially significant graft copolymers are acrylonitrile-butadiene-styrene (ABS) resins and impact polystyrene (IPS) plastics. Both of these families of materials were once simple mechanical polymer blends, but today such compositions are generally graft copolymers or blends of graft copolymers and homopolymers.

ABS is the sixth largest volume thermoplastic resin and the principal engineering (structural or load bearing) plastic (89). ABS is a terpolymer manufactured by copolymerizing acrylonitrile and styrene in the presence of polybutadiene

**B. FIGURES OF U.S. PATENT APPLICATION NO. 10/798,462**

**FIG. 1**



VECTOR 230 mm  
SMOKE  
COATED

CONTROL  
HAM

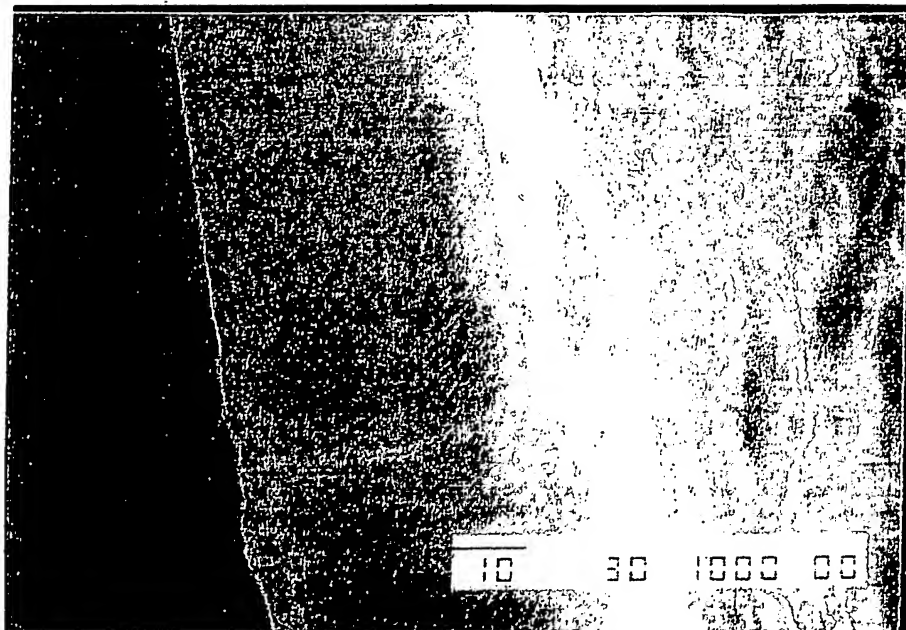
**FIG. 2**



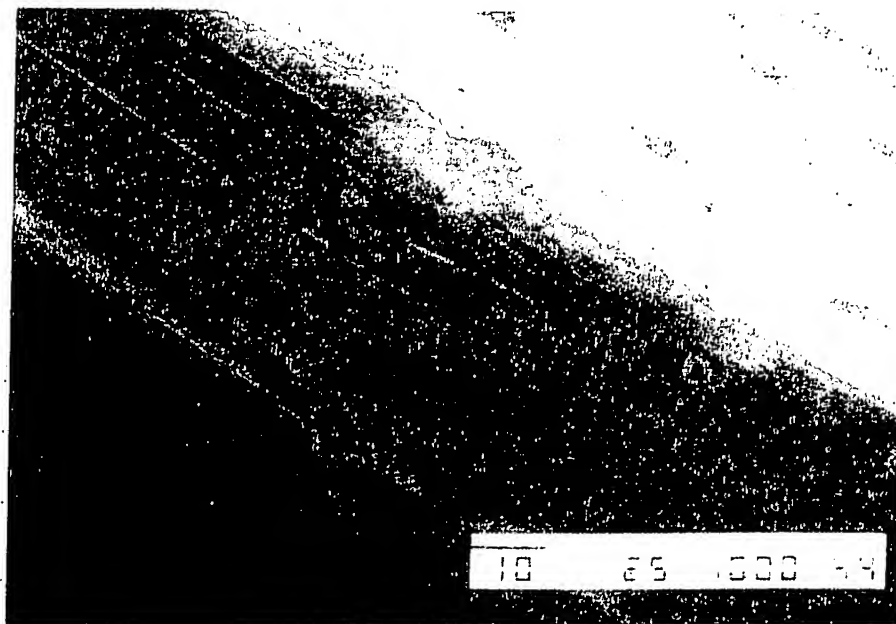
CONTROL  
TURKEY

VECTOR 195 mm  
SMOKE  
COATED

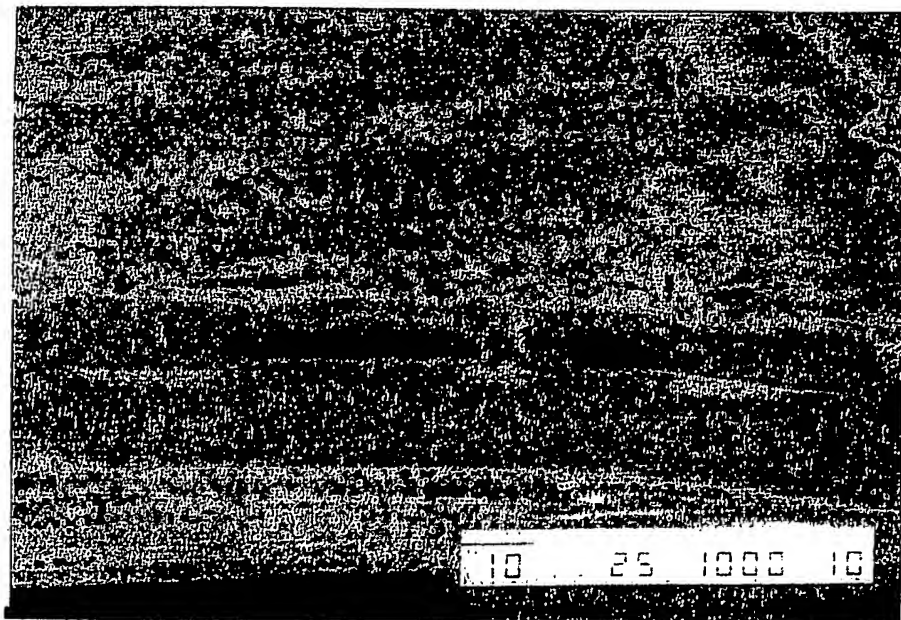
**FIG. 3**



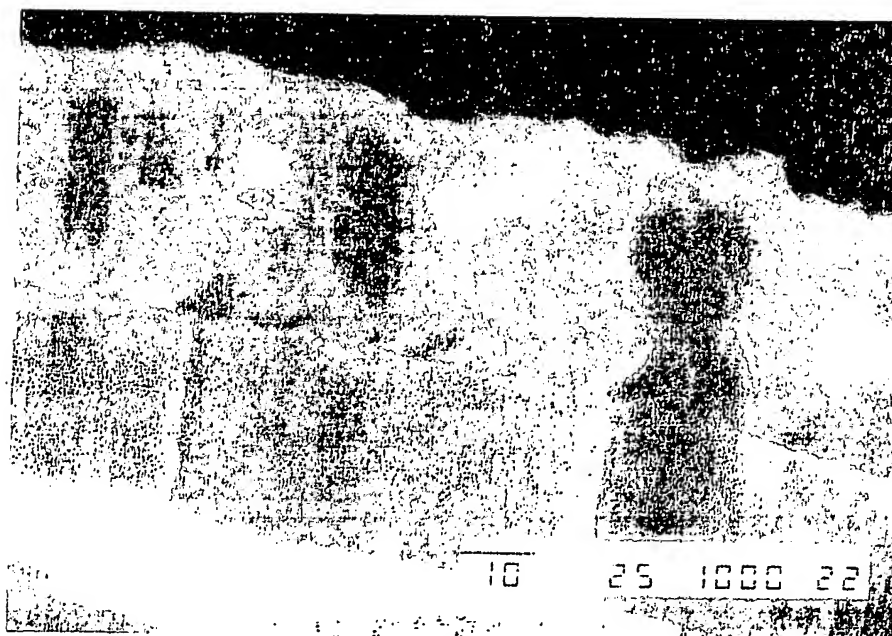
**FIG. 4**



**FIG. 5**



**FIG. 6**





## **RELATED PROCEEDINGS APPENDIX**

None.